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MDCCCXLIX.

A MANUAL

OF

PATHOLOGICAL ANATOMY

BY

CARL ROKITANSKY, M.D.

CURATOR OF THE IMPERIAL PATHOLOGICAL MUSEUM, AND
PROFESSOR AT THE UNIVERSITY OF VIENNA, ETC.

IN FOUR VOLUMES

VOL. II

LONDON
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MDCCCXLIX

C. AND J. ADLARD, PRINTERS,
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THE

PATHOLOGICAL ANATOMY

OF

THE ABDOMINAL VISCERA

TRANSLATED FROM THE GERMAN

BY

EDWARD SIEVEKING, M.D.

MEMBER OF THE COLLEGES OF PHYSICIANS OF LONDON AND HAMBURGH,
PHYSICIAN TO THE NORTHERN DISPENSARY, ETC.

EDITOR'S PREFACE.

THE principal hospital of the Austrian capital, the largest in the world, offers very extensive opportunities and unusual facilities for the cultivation of Pathological Anatomy. Exclusive of the Lying-in Hospital and the Lunatic Asylum, which occupy the same range of buildings, the Kaiserlich-Koniglich-Allgemeine-Krankenhaus[1] (Imperial Royal General Hospital) contains 104 wards, capable of receiving 2214 patients; 1247 beds being destined for males, and 967 for females. We find that in 1838,[2] the number of patients treated amounted to 20,545; of these, 2678 died, giving a mortality of 13·03 per cent., or one death in 7·6 cases. As I am not provided with tables of mortality for other years, I am unable to state the average annual mortality in the hospital; but it does not appear, by a comparison with the mortuary tables of the Viennese Foundling Hospital,[3] that the year 1838 was marked by peculiar endemic or epidemic influences. By the laws of the hospital, post-mortem examinations may be made of all who die within its walls.[4] "To examine all, or one half, would be impossible;" but as "generally from four to six bodies are opened daily,"[1] the extent of the field presented for cadaveric research may easily be estimated. For a series of years the Professorship of Pathological Anatomy has been held by Dr. Carl Rokitansky, and the numbers of medical men of all nations who are attracted to Vienna by him, are the best evidence of the manner in which he has availed himself of the opportunities at his disposal. All who have been fortunate enough to attend the Professor's demonstrations, will be able to award him the praise of untiring industry, of acute judgment and candid research. Records of every case, taken down at the dictation of the Professor, are kept, and all interesting specimens are preserved for the Pathological Museum. Rokitansky has embodied the facts observed, and the conclusions deduced from them, in his 'Handbuch der Pathologischen Anatomie,' published in Vienna during the years 1841—1846. The original forms three large octavo volumes; of which the third, containing the Pathological Anatomy of the Organs of Respiration and Nutrition, and of the Uro-genital Tract, appeared first; the second, embracing the Morbid Anatomy of the remaining Organs and Systems of the Body, followed; and the first, in which the Professor gives a philosophical survey of the entire Science of Morbid Anatomy, was published last. The Council of the Sydenham Society have determined upon issuing the translation in a similar sequence. Owing to the acknowledged difficulty of the author's style, it has however been thought advisable to divide the translation into four volumes, each of which is intrusted to a different editor.

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[1] Knolz, Darstellung der Humanitäts und Heilanstalten Wiens, &c. Wien, 1840, p. 169. Wilde, Austria and its Institutions. Dublin, 1843, p. 124.

[2] Knolz, l. c. p. 316.

[3] Ib., l. c. p. 56.

[4] Ib., l. c. p. 190.

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[1] Wilde, l. c. p. 180.

The present volume contains the Morbid Anatomy of the Digestive Apparatus and the Uro-genital Viscera, which constitute the greater part of the third volume of the original. The succeeding two volumes will embrace the remaining portion of the third, and the second volume of the original, and each of these will be complete in themselves, as far as regards the Special Pathology of the parts of which they treat. The first volume, which contains the Principles or Theory of Morbid Anatomy, is a scientific *exposé* of the deductions and inferences drawn by the author from the facts and illustrations given in the other sections of the work, and will be the last to appear. His views, as laid down in the volume of General Morbid Anatomy are unintelligible to one who has not previously studied the volumes of Special Pathology; this accounts for the apparent inconsistency of publishing the translation in the order adopted. Were it not that the Council of the Society have desired to adhere as much as could conveniently be done to the original, the present volume might with perfect propriety have been termed the first, and the succeeding volumes have been numbered in the order of their publication.

The fact of the Work having been selected for translation by the Council of the Sydenham Society, is in itself a proof that it is deserving of the high estimation in which it has been held by all pathologists acquainted with continental literature; but it may not be superfluous to state that the value of the Professor's remarks is enhanced by his being entirely unfettered by pre-conceived notions or prejudiced views, as to the disease of the individual brought to the dead-house for examination. "Rokitansky," as Mr. Wilde correctly remarks, "differs from all other pathologists, in not engaging in the study or treatment of disease during life; he is not a practical physician, and seldom sees one of the many hundreds of cases, whose bodies he dissects." English readers will probably sometimes desire more positive statistical data than the author vouchsafes; and I cannot but express a hope that in the new edition which Professor Rokitansky is preparing, he will in some measure repair an omission, which necessarily weakens his conclusions, and deprives them of that basis which the student looks for in pathological anatomy, more even than in other departments of the natural sciences. I may, however, venture to assert, that no one will read his descriptions of post-mortem appearances without feeling convinced that they are drawings from nature.

Of the difficulties connected with the translation, I will only say that they are much increased by the figurative style of the author. He constantly uses terms in a sense peculiar to himself, and his total disregard for the ordinary rules of composition is an additional and frequent source of obscurity. It has been necessary to adopt a few terms in the translation which, though new to the reader, have been thought to convey most accurately the peculiar and idiomatic expressions of Professor Rokitansky; this has not, however, been done except where no word or phrase familiar to British pathologists could be found exactly to convey the meaning of the author.

In regard to the translation generally, I can only express a hope that I have not perverted the sense of the original by the necessary reconstruction of many passages, nor that in adhering too closely to the German, I have failed in making the English edition readable.

In conclusion, I avail myself of this opportunity to acknowledge the honour conferred upon me by the request of the Council of the Sydenham Society to undertake the translation; and I have great pleasure in recording the obligations which I am under to Dr. J. R. Bennett, the Secretary of the Society, for the courtesy and assistance he has afforded me while the work was going through the press.

E. S.

BROOK STREET, GROSVENOR SQUARE.

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PART I.

ABNORMITIES OF THE DIGESTIVE APPARATUS.

CHAPTER I.

ABNORMITIES OF THE ALIMENTARY TUBE.

SECT. I.—ABNORMITIES OF THE MOUTH AND FAUCES.

§ 1. *Deviations in Form and Size.*—As excess of development, we have here to mention the more or less complete repetition of one or more parts, which sometimes advances to such an extent that the bones of the jaws, the mouth, and the tongue are double, and unite in one common gullet. As defective formation, which may generally be distinctly traced to an arrest of development, we meet with complete absence of the cavities of the mouth and fauces (astomia), or imperfect development of individual parts, as of the superior maxilla, giving rise to an imperfect development of the face (ateloprosopia), of the lower jaw (agnathia and atelognathia), of the lips (achelia and atelochelia), of the tongue, &c.

The most common and important cases of arrest of development are :—Fissures of the upper lip, on either or both sides of the mesian line, corresponding to the union of the intermaxillary with the superior maxillary bones, which may or may not present a fissure also (harelip, labium leporinum); fissures of the palate, caused by the absence of the os incisivum and the middle portion of the upper lip, or by the mere disunion of the palatal processes in the middle line; or again, by defect in the latter on either or both sides, with or without an accompanying absence of the os incisivum; the fissures of the soft palate, varying equally in degree, from complete division to a mere indication of the anomaly in a slight notch of the uvula. Fissures of the tongue are extremely rare, and seldom present more than a mere trace of division; fissures of the nether lip, and of the lower jaw in the mesian line, are equally rare.

Closure of the mouth (atresia oris) is a rare occurrence, as contrasted with the frequency of a similar condition at the anus.

Numerous morbid processes are followed by anomalies that resemble the above congenital malformations, such as partial or total loss of the lips, of the cheeks, of the palate, contraction of the mouth to a degree approaching atresia, adhesion of the cheeks to the maxillæ, of the tongue to the cavity of the mouth, contraction of the fauces, &c.

Increase of size, as a result of hypertrophy, occurs chiefly in the shape of hypertrophy of the lips and the tongue; it varies in degree, and is peculiar to the scrofulous cachexia and to cretinism; it is also presented as hypertrophy of the tonsils, and of the glandular stratum of the soft palate, as hypertrophy of the uvula, and occasionally of the gums.

The opposite condition, i. e. diminution of size and, taken in reference to the capacity of the oral cavities and the fauces, contraction, occurs in an eminent degree in the shape of atrophy of the tonsils, and also of the other muciparous glands, and of stenosis of the isthmus faucium. The latter results from cicatrization of syphilitic and scrofulous ulcers, and occasionally proceeds to such a degree that the isthmus scarcely permits the passage of a pea.

§ 2. *Textural Diseases.*—Of these, inflammatory processes, and especially those affecting the mucous membrane and its glands, demand primary consideration.

Catarrhal inflammation is particularly liable to attack the pharyngeal mucous membrane, and to be associated with a marked affection of the tonsils, in the shape of cynanche tonsillaris. It is either acute, or chronic, is apt to return, and become habitual; it frequently, and in many individuals constantly, passes not only into superficial ulceration, but even into phlegmonous inflammation and the formation of abscesses in the tonsils; or it leaves a permanent relaxation of the fauces, with a varicose state of the vessels, elongation and œdema of the uvula, chronic hyperæmia, and tumefaction of the tonsils, and blennorrhœa of the tonsils and fauces. It frequently extends to the mucous membrane of the rima glottidis and of the larynx, as well as to that of the Eustachian tube.

The croupy process of the mucous membrane of the mouth and fauces occurs, in the first instance, in the well-known form of thrush and aphthæ in children; and in adults, commonly with an epidemic character of an adynamic septic type, as malignant (gangrenous, aphthous) sore throat (angina gangrænosa, the diphtheritis of Bretonneau). In the former case, after a previous vivid or dark purple reddening of one or more papillæ, and the vesicular elevation of the epithelium at the point and the sides of the tongue, dots or patches, of the size of a lentil or pea, appear on the inner surface of the lips and cheeks, and finally, on the mucous membrane of the fauces. They present an exudation, which has a frosted, or flocculent, or villous appearance, or is more of a membranous character, and extends into the cavities of the follicles; it is of a grayish, or yellowish-white colour, and of a lardaceous, or soft, creamy, or fluid consistency; if removed, a shallow excoriated depression, surrounded by an inflamed margin, remains, on which the exudation is repeated, involving a further destruction of the mucous tissue.

In the second instance, livid spots, which rapidly coalesce, and become invested with a dirty, gray, shaggy, pultaceous and sanious exudation, form upon the softened, bleeding gums, and the mucous membrane of the cheeks, the fauces, and the tonsils. The gums themselves ultimately degenerate into a bad-looking, pulpy, sanious mass, and the mucous membrane of the cheeks and fauces, underneath the exudations, is equally found converted into a friable, fetid pulp, or a firm slough.

These processes often extend to the pharynx and the œsophagus, though scarcely ever to the respiratory passages; they are sometimes complicated with exudative processes on other mucous and serous membranes.

Genuine (primary) pharyngeal croup occurs rarely; it is either the result of an extension of tracheal croup, or, similar to exudative processes with products of a different nature, an anomalous process of a specific, acute, exanthematic, impetiginous, typhous character, or it is the result of a spontaneous or purulent disorganization of the blood. It not unfrequently leads to acute gastric softening.

Pustular inflammation occurs in the fauces in variolous disease; the mucous membrane being tumefied, and invested with a plastic mucous secretion.

There are other circumscribed inflammations of the buccal and pharyngeal mucous membranes, which are remarkable for their tendency to pass into ulceration, viz. the syphilitic, syphiloid, mercurial, and scrofulous inflammations. They are generally characterised by their peculiar red tinge and defined edges, and give rise to various products which dissolve the tissues in a peculiar manner, and consequently to specific ulcers. Syphilis, more particularly, is, in this phase of its existence, and so far as the alimentary tract is concerned, limited to the fauces.

The last-mentioned ulcers and aphthous ulcerations, give rise to more or less considerable loss of substance in the mucous membrane and the subjacent tissues, after the cure of which, white, indurated, elevated, retiform, and tendinous cicatrices remain, which induce a corresponding contraction.

Among the inflammations attacking individual structures, we have to mention inflammation of the gums, especially the rheumatic variety, with coexisting affection of the alveolar periosteum, as also the scorbutic forms and the inflammation of the tongue with its occasional termination in deep-seated suppuration.

An important disease that we must here speak of, is *noma,* a phagedenic ulceration which commences at the inner surface of the cheek, and rapidly spreads, involving the soft parts in gangrenous destruction. A livid congestion of the mucous membrane precedes, corresponding with which there is an erysipelatous redness externally; a hard tumour then forms; the tissues are broken up into a pulpy sanious mass, the subcutaneous cellular tissue is dissolved into a pale yellowish, gelatinous, oily mass; the superficial integument, at the same time, becomes pale, and is converted into a similar mass, or dries up into a dry, brownish-black eschar; the surrounding parts presenting erysipelatous redness and œdema. This process not unfrequently spreads over the entire cheek and gums, denuding the maxillary bones, and involving them in a species of calcination. (Froriep.) It is rarely met with except in children, and commonly attacks weakly cachectic individuals; it frequently occurs as a sequela of exanthematic diseases, and of typhus, and then represents a degeneration or an anomaly in the latter.

§ 3. *Adventitious Growths.*—Among these we have first to notice the fibroid tumours occurring on the alveolar processes under the name of *epulis,* and in the fauces as *polypi;* they have a broad base, or are pediculated, are of soft or hard texture, of a rounded, oval, or lobulated form, and are invested with a spongy, ulcerated, and often bleeding mucous membrane.

Cancerous morbid growths do not often occur, if we except two cases in which a malignant tumour has made its way into the mouth or the fauces from without. Cancerous degeneration of the tonsils is peculiarly rare, and the cases that have been recorded as such have almost invariably proved to be instances of mere hypertrophy with induration. Still cancer of the lips, and especially of the nether lip and of the tongue, where it chiefly attacks the posterior half, is not unfrequent; from these points it branches out between the muscles at the floor of the mouth, and at the sides of the fauces down to the neck, and on the tongue it gives rise to an irregular, sinuous, callous, and fungous ulcer, which is surrounded by an indurated margin of mucous tissue.

§ 4. *Anomalies in the Secretions.*—We have, under this head, to notice, in addition to those already spoken of, the different secretions which cover the mucous membrane of the mouth, and especially of the tongue, in various chronic and acute diseases, and the concretions occurring in the sinuses of the tonsils. In scrofulous subjects the tonsils are often affected, in addition to hypertrophy and habitual hyperæmia, with a peculiar blennorrhœa, and the purulent secretion not unfrequently becomes inspissated, so as to form tubercular cheesy plugs, or even chalky concretions. These, in their turn, keep up a perpetual state of irritation in the tonsils.

SECT. II.—ABNORMITIES OF THE PHARYNX AND ŒSOPHAGUS.

§ 1. *Defect and Excess.*—It is only necessary to allude to the congenital absence of this passage as occurring in acephalous monsters, to its partial defect with a blind termination, its fusion with the trachea, to the saccular dilatation of the canal resembling the craw of a bird, to its being double in disomatic monsters, and to the very rare occurrence of insulated fissures in individuals that are otherwise normally built (Meckel).

§ 2. *Acquired Abnormities of the Caliber, and the thickness of the Parietes.*—Anomalies of the caliber present themselves in the shape of *dilatations* or *contractions*.

Dilatation may affect the pharynx and œsophagus throughout, or almost throughout, and give them a cylindrical or a fusiform appearance; when it affects the œsophagus, it may be partial, in which case either pouches are formed, which involve all the coats of the œsophagus, and which may be developed at all points of its circumference; or the mucous membrane alone dilates, giving rise to diverticula or herniæ of the mucous membrane through the muscular coat.

The *first* variety has only been observed in a few cases, though when it occurs it is developed to an advanced degree, and presents thickening of the parietes, and particularly hypertrophy of the muscular coat. It appears to be sometimes the consequence of concussion of the œsophagus by a blow or contusion of the chest. One preparation, in the Viennese collection, presents an œsophagus large enough to allow the passage of a man's arm; in another case (Hanney), the circumference of the dilated passage was six inches.

Dilatations of a lower degree sometimes occur, in which the œsophageal coats are in a condition of paralytic relaxation and attenuation.

The *second* variety is seen at various points, and in various degrees, above contractions, and especially above scirrhous strictures.

The *third* variety is rounded; or, if it increases to a considerable size, we find cylindrical or conical dilatations of the mucous membrane, occupying the lateral portions of the œsophagus. They may form at all parts of the œsophagus, but they are most frequently seen near the bifurcation of the trachea, and they attain the greatest size at the inferior section of the pharynx (Baillie), where the fibres of the inferior constrictor have an horizontal position. The mucous membrane is protruded between the muscular fibres, and becomes dilated by the food that enters; it is at last forced out in the shape of a cylindrical appendix, which lies between the vertebral column and the œsophagus, in a line with the axis of the pharynx, so that all ingesta pass into it, and death from starvation results.

The origin of the diverticulum is in many cases peculiar; thus we are acquainted with an instance in which the mucous membrane of the œsophagus was dragged out in consequence of the shrivelling of an adherent tracheal gland.

The fauces and the œsophagus are not unfrequently subject to contraction, from being compressed by the enlarged thymus gland, by aortic aneurisms, adventitious growths, &c.; but the contractions resulting from textural changes in the coats are of more importance, and among these we must more particularly allude to stenoses brought on by cicatrization after corrosion by caustic substances, and by cancerous affections (cancerous stricture). Of both we shall have further occasion to speak in the sequel.

§ 3. *Anomalies of Position.*—Among these we reckon the position of the œsophagus to the right of the spinal column, accompanying a lateral transposition of the intestines, the changes produced by curvatures of the spine, the flexures or dislocations of the pharynx and œsophagus, brought about by hypertrophy of the thyroid gland, by aneurisms, abscesses, morbid growths, &c.

§ 4. *Solutions of Continuity.*—Among these we reckon, besides wounds of the pharynx and œsophagus, by means of fire-arms, or other penetrating instruments, the injuries and perforations caused by foreign bodies that have been swallowed, the perforations from softening, ulceration, gangrene, or from absorption in consequence of pressure, e. g. by aneurisms, by which means the most various passages, communicating with the neighbouring serous cavities, the respiratory organs, the adjoining vascular trunks, &c., may be established, and lastly, those very rare occurrences of spontaneous rupture, without previous alteration in the tissue.

§ 5. *Textural Diseases.* 1. *Inflammation.*—Catarrhal inflammation:—This is rarely seen very intense in the acute, but certainly not uncommonly in the chronic form. The appearances produced in that case are œdema of the mucous membrane, with a dirty brown or slate-coloured tinge, enlargement of the follicles, blennorrhœa, and an exuberant formation of epithelium, and hypertrophy of the muscular coat. It is possible that when the cardiac orifice is the seat of inflammation, the consequent hypertrophy of the circular fibres, and the narrowing of the passage, may give rise to those enormous dilatations of the œsophagus, of which we have already spoken. It frequently occurs as an idiopathic, but also as a secondary affection, and in the latter case chiefly in connexion with impetigo.[1]

Croupy (exudative) inflammation—occurs as an aphthous process in children, as true diffused croup, coexistent with, or unaccompanied by, croup of the tracheal, bronchial, and pulmonary (pneumonia) mucous membrane, mainly in typhoid cholera, but also as a secondary affection and as an abortive exanthematic and typhoid process, the product of a purulent condition of the blood, brought on by tubercular and cancerous cachexia.

Pustular inflammation:—To this class belongs the rare occurrence of varioloid pustules, the pustules of metastatic herpes, and the pustules which occur at the lower third of the œsophagus in consequence of the internal administration of tartar emetic in large doses.

In addition to the above varieties, we meet with inflammation, which is produced by the corrosion of caustic substances; the coexistent affection of the oral cavity and the fauces being commonly of a lower, that of the gastric mucous membrane of a higher degree. We refer the reader, for an investigation of this process and its consequences, to the following pages, as we purpose examining it among the diseases of the stomach, in reference to all the tissues we have alluded to; at present we merely add, that in those cases in which the mucous membrane has been destroyed by the energetic action of the poison, it is replaced by a serous and sero-fibrous tissue, which gives rise to peculiar valvular and annular strictures of the œsophagus, somewhat analogous to those consequent upon dysentery.

2. *Softening.*—Softening occurs at the lower third of the œsophagus, and is commonly associated with softening of the stomach. On account of the identity of the two affections, we refer the reader to the section on the diseases of the stomach; the more, since the process is observed more frequently in the latter, if not in a more fully developed form. We must however add, that it is particularly liable to affect the left side of the œsophagus, and then to cause perforation, in consequence of

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[1] [To render this passage intelligible, it may be well to remind the reader of the theory very prevalent among German pathologists, which attributes the majority of chronic diseases to dormant or suppressed cutaneous eruptions. Autenrieth may be mentioned as the chief supporter of this doctrine.—Ed.]

which we have destruction of the cellular tissue and the left mediastinum, and effusion of the gastric contents into the left pleura.

3. *Morbid growths.*—*a.* Anomalous fibrous and fibro-cartilaginous tissue occurs as a fibroid or fibro-chondroid tumour, in the shape of a moveable bluish-white concretion, varying in size from a pin's head to a kidney-bean, and occupying the submucous cellular tissue of the œsophagus; and also as a fibrous polypus, attached by a neck to the perichondrium of the cricoid cartilage, and depending from it into the œsophagus; the free surface is frequently lobulated, and it is invested by mucous membrane.[1]

b. Tubercular deposits are rarely, if ever, found in the œsophagus, and they must not be confounded with the tubercular degeneration of the neighbouring lymphatic glands.

c. Carcinomatous affections, in the shape of scirrhus and medullary sarcoma, are more frequent. This is generally a primary disease, though the œsophagus may become secondarily involved in carcinomatous degeneration of the mediastina. In the former case the cancer may be found in every portion of the pharynx and œsophagus; but the upper part of the thoracic portion of the latter, and the inferior part of the former, appear to be more frequently attacked than the cardiac portion of the tube. The degeneration generally affects the circumference of the passage, and thus gives rise to annular stricture, the extent of which must correspond to the extent of the carcinomatous deposit. The œsophagus soon becomes fixed by the adhesion of the diseased mass to the spinal column. The metamorphosis of the morbid product frequently gives rise to the formation of large sanious cavities, the carcinomatous parietes of which are covered with fungoid granulations, and with which the œsophagus communicates above and below in a transverse or slanting direction. The sanious discharge frequently causes ulcerative destruction of the neighbouring tissues, by which means communications are established with the trachea and the bronchi; occasionally even the arterial coats, which are otherwise endowed with great power of resisting such influences, become involved, and communications with the arterial trunks in the vicinity, and more especially with the aorta and the right pulmonary artery, are established.

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[1] Oestr. Jahrb., xxi, 2.

Cancer of the œsophagus generally occurs in an isolated form, i. e. without a coexistence of the disease in other organs.

§ 6. *Foreign Bodies.*—Sometimes small hard bodies, such as cherrystones, give rise to serious occurrences, by causing, at different parts of the œsophagus, but chiefly at the lower constrictor of the pharynx (Baillie), the formation of diverticula. Very large and hard bodies, such as are sometimes swallowed by lunatics, remain fixed at a certain spot, and may cause inflammation and suppuration; or, by extreme pressure, even give rise to gangrene and perforation of the œsophagus. Pointed and rough bodies, and especially needles and fish bones, are still more likely to produce perforations of the œsophagus in different directions, and to reach the aorta or trachea.

SECT. III.—ABNORMITIES OF THE PERITONEUM.

§ 1. *Defect and Excess of Formation.*—Arrest of development in the peritoneal sac occurs in the shape of fissure in the mesial line, or external to it; in the case of the diaphragm being absent, of a fusion with the pleura; as defective development of the mesentery at various points, as defective development or complete absence of several other folds, the omentum, the appendices of the omentum, as deficiencies in these parts, &c.

Excess of development frequently occurs in the shape of unusual length of the duplicatures, e. g. of the omentum, the mesenteries, &c., or of supernumerary folds and peritoneal pouches. These are chiefly found in the hypogastric, and more especially in the iliac and in the inguinal regions, and near the fundus vesicæ. There is access to these sacs by a well-defined fissure or ring, which is frequently surrounded by a tendinous band, lying in the duplicature. In the case of their inclosing portions of the intestine, they may give rise to internal incarceration, which, on the one hand, resembles external hernia, on the other, does not afford the diagnostic signs peculiar to this affection, and may, therefore, be considered as forming a transition between external and internal hernia. Similar formations, such as a delicate serous envelope of the small intestine, must be explained by an original anomaly in the development of the peritoneum.

§ 2. *Anomalies in the Size and Form of the Peritoneal Sac.*—Among these we reckon a general increase of the peritoneal surface, corresponding with a congenital enlargement of the abdominal cavity and the intestines; the acquired extension, which may be uniform, as the result more especially of an accumulation of serous fluid (ascites); or partial, as presented to us in congenital or accidental hernia, and in the abnormal size or acquired elongation of single folds: the latter are brought about by dislocations of the abdominal contents, which arise spontaneously, or from a variety of causes, are most frequently seen affecting the mesenteries and the omentum, and are of signal importance in reference to the causation of internal hernia.

A small peritoneum is the result of an arrest of development in the abdominal cavity, subordinate to the development of the pleura; an apparent diminution may be caused by dislocation of the abdominal contents, as in large scrotal or diaphragmatic hernia.

The anomalies of *form* are involved in the above anomalies of size.

§ 3. *Solutions of Continuity.*—The peritoneal sac is liable to solutions of continuity from penetrating wounds of the abdomen, from the effect of powerful concussion, of excessive bodily exertion, from spontaneous ruptures of the hollow or parenchymatous organs it invests, in consequence of traumatic injuries, from contusion, rupture, and separation of the subjacent tissues. The extent and nature of the injury vary as much as its situation.

§ 4. *Abnormities of the Tissues.* 1. *Hyperæmia.*—Hyperæmia is either general, or, when caused by the congested state of an organ invested by the peritoneum, partial. It gives rise, on the one hand, to an increase of secretion and to dropsical accumulations in the peritoneal cavity; on the other, to hypertrophy and thickening of the serous tissue, and to the development of a subserous fibroid or fibro-chondroid growth. The peritoneal investment of the spleen offers the best illustration of the latter.

2. *Inflammation* (Peritonitis).—Inflammation of the peritoneum presents the symptoms common to inflammation of serous membranes. It may occur as an idiopathic affection, or in consequence of traumatic lesions of the abdomen, of pressure from incarceration, or from contact with the atmosphere, with the contents of the stomach or intestines, with bile, urine, vaginal secretions, blood, or pus. It may be presented to us in the form of spontaneous or rheumatic peritonitis; it may occur as the result of a propagation of disease from the organs contained in the peritoneal sac. The most frequent form is the one attributed to metastasis, in which the peritoneum, from the large serous surface which it offers (and in this respect it presents an analogy with the vast tract of the intestinal mucous membrane), and, owing to its proximity in many cases to the primary seat of disease, is converted into a focus of extensive exudative processes. To this class we refer more particularly the inflammatory and exudative processes of puerperal fever, of which we shall have occasion to speak more fully at a future period.

The affection is either general or partial. In the former case, it involves the peritoneum of the abdominal parietes, of the parenchymatous viscera, and of the colon (enteritis peritonealis), though generally with a predominance in one or the other. In both it may appear in the *acute* or *chronic* form.

Acute general peritonitis very often terminates fatally, with symptoms of intestinal paralysis, and with imminent or existing ileus; or death is caused by exhaustion, which gives rise to the formation of large fibrinous, puriform and purulent exudations. We then find, in addition to the symptoms of serous inflammation, an enlargement of the intestine; it is expanded by gases (tympanitis), by thin watery and feculent matters; the coats of the intestine, and chiefly the interstitial cellular tissue and the mucous membrane, are tumefied, the muscular layer is pale, and they are all fragile and friable.

The tumefaction of the intestinal coats is commonly owing to an infiltration of the tissues by a watery fluid, and increases in proportion to the degree in which the mucous membrane participates in the exudative process. It occurs in the most exquisite degree in the so-called metastatic form, in that inflammation of the peritoneum which is the local expression of a general disorganization of the blood, i. e. in the puerperal type. In this case the mucous membrane presents a relation similar to that exhibited by the peritoneum in exudative processes of the mucous membrane, in Asiatic cholera, in colliquative diarrhœas generally, or in dysentery in the shape of a viscid mucous secretion, or of a delicate indication of plastic exudation, evidenced by mere loss of brilliancy and smoothness.

The ileus,[1] which occurs in general peritonitis, is, like the dilatation of the intestine, the consequence of paralysis of the muscular coat; a relation observed to exist wherever muscular fibres are subjacent to serous membranes. The exudation of plastic lymph, especially in the case of various abnormal contortions, is also likely to contribute to its occurrence by binding down the intestine. We may easily infer which will be the terminal point of the antiperistaltic movement, or of ileus, in cases of enteritis peritonealis. As the inflammation of the peritoneum is accompanied by paralysis of the entire intestine, it can be no other portion of the intestine than the duodenum, at the lower end of which the peritoneum, and consequently the inflammation and paralysis, terminate, and which by itself is, under no circumstances, capable of controlling, by its peristaltic action, the accumulated contents of the small intestines which are being thrown into it. Yet cases which, like puerperal peritonitis, are generally accompanied by diarrhœa, form exceptions to this rule.

The exudations seen on the peritoneum, exhibit, in reference to quantity and minute structure and to their metamorphoses generally, all those variations which we have cited in the general remarks on inflammation of serous membranes. The general remarks there made with regard to the acute and chronic forms of the process, are equally applicable here. Nevertheless, we observe numerous peculiarities in peritonitis, to which we must here advert. We very frequently find extensive, cacoplastic, disorganized, discoloured, septic exudations, accompanied by an almost imperceptible increase of redness and vascularity; they are more especially associated with puerperal, septic processes in the uterus. Plastic exudations become organized into cellular or cellulo-serous tissue. This remains attached to the peritoneum in the shape of a pale, grayish-white, or bluish-red and vascular, or slate-coloured accumulation; or it forms a new moveable cellulo-serous investment to all organs enveloped by the peritoneum, or it assumes the shape of flakes or strings, which pass from one to the other in different directions. In the two latter cases, various tense or loose adhesions between the abdominal viscera, among themselves, or with the parietes of the abdomen, will result; of these the following are the chief:—

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[1] Vide Oestr. Jahrb., xviii, 1.

Adhesions of the intestinal coils, producing very manifold transpositions among themselves, and with the mesentery, with the colon, in reference to the hypogastric parietes of the abdomen and the pelvis, the bladder, and the internal sexual organs of the female;—adhesions of the omentum in various degrees with the hypogastric parietes of the abdomen, and more particularly of the inguinal region, and with the internal sexual organs of the female; the omentum may be folded together, or rolled up, and stretched across in a slanting direction to either of the inguinal regions, or it may descend with a furcate fissure to both, so as to attach itself at these points, and form a vertical, or, if passing under the colon transversum, a rounded horizontal band; thus giving rise to a species of diaphragm, which separates the mesogastric and hypogastric regions;—and adhesions of the parenchymatous viscera to the adjacent parietes and to the neighbouring viscera.

Adhesions between the omentum and the colon, and the anterior parietes of the abdomen, are found chiefly in chronic peritonitis, but they are not of frequent occurrence.

The corded exudations may, in various ways, cause incarcerations of the intestine.

Or the exudations undergo metamorphoses, so as to give rise to tendinous or fibro-cartilaginous laminæ, sometimes of uniform thickness, and with defined edges, sometimes of areolar or cribriform structure, at others, uneven, lobulated, granulated, thinning off towards the circumference, glued on to or fused with the thickened peritoneum. This is remarked, principally, on the omentum and the fold of the intestine in hernia, or on the hernial sac itself, and also on the convex surface of the spleen, on the liver, sometimes on the uterus and its appendages, and in rare cases on the entire extent of the peritoneum.

The *chronic* form of inflammation, which affects the exudations that have already been deposited, and creeps on with occasional exacerbations, presents the following peculiarities: It occupies the intestine only; or at least that part of the circumference of the intestine chiefly which is not affected by adhesions resulting from a previous process, as well as the opposed parietal surface, which in various degrees is limited by, or free from, adhesions. The consequence is the formation of a coagulum, which covers the anterior surface of the already agglutinated intestines, passing from them to the parietes, and thus inclosing a sacculated space which contains the fluid portion of the exuded matter. In such a case the intestines, and more particularly the small intestines, form a flattened round mass, riding upon the vertebral column, and invested anteriorly by the posterior lamina of a pseudo-membrane, which contains in its cavity a varying amount of fluid.

Hemorrhagic exudation is frequently seen on the peritoneum; it forms large, saturated coagula, disposed in thick layers. Thin strata present a deep black or bluish-black discoloration, the effect of the intestinal gases.

Peritonitis occasionally terminates in suppuration or gangrenous decomposition, *phthisis*, and *gangræna peritonæi*. With the exception of those cases, in which purulent or gangrenous disorganization and perforation result from a propagation of the disease from other tissues, this termination occurs under the following conditions:

a. The peritonitis itself yields a purulent exudation, and the peritoneum is destroyed by suppuration, followed by the denudation and suppuration of the subjacent tissues. This occurs chiefly in partial, circumscribed peritonitis, when the exciting causes, viz. suppurative inflammation or gangrenous infiltration of an organ, accompanied by a purulent or ichorous discharge on the peritoneal surface, continue.

b. Occasionally a certain portion of a fibrinous exudation does not become organized, but being diffused through the interstices of the adventitious membrane, melts into a creamy pus, which, being in close contact with the latter, produces at once in it and in the peritoneum suppurative inflammation and suppuration.

In either case, ulcerative perforation of the intestine or of the abdominal parietes frequently proceeds from the morbid process in the peritoneum; and when, as is sometimes the case, both occur simultaneously, fistulæ result.

Partial peritonitis in many cases appears to be a *molimen naturæ,* destined to circumscribe destructive processes, to arrest imminent or existing discharges which are hostile to the integrity of the peritoneum. To these belong, first of all, the circumscribed inflammations of the peritoneum, which take place in the vicinity of approaching or existing perforations of the stomach, the colon, the vermiform process, in the vicinity of purulent accumulations external to the peritoneum, threatening perforation and discharge into the peritoneal cavity, and the like. By this means, general peritonitis, and a consequent rapid and fatal termination are frequently postponed for a long time; yet, whilst the exciting cause continues, peritoneal phthisis, with its consecutive disorganization, must ensue; or the adhesions which limit the focus of inflammation give way, and, in consequence of the free discharge of its contents, general peritonitis follows, or this may take place without the occurrence first mentioned, in consequence of the violence and extent of the inflammatory process at the original seat of the disease.

Gangrene of the peritoneum occurs as a yellow slough, in consequence of pressure or traction caused by external or internal hernia, in consequence of its being deprived of the subserous cellular tissue where it overlays perforating ulcers of the intestines and abscesses; or as gangrenous disorganization and conversion into a blackish, moist, ragged, and friable tissue.

3. *Heterologous formations. a. Anomalous occurrence of cellular and of serous tissue.*—This appears on the peritoneum in the shape of the above-mentioned organizing processes of a plastic character, and especially as serous cysts, in which case the pseudo-membrane includes, during its organization, a portion of the fluid exudation, and receives an internal serous investment. Such bladders are either connected with the peritoneum by means of a neck or stalk, or adhere to it by a broad base. In rare cases we find cysts with various contents

as new formations on certain portions of the peritoneum, and then most frequently on the omentum.

b. Anomalous fibrous (*fibro-cartilaginous*) *tissue*—owes its origin to the inflammatory process in a similar manner as that above described. But there are, besides, other instances of the occurrence of this tissue, in the shape of fibro-cartilaginous smooth or lobulated laminæ, projecting granulations, &c., occupying the subserous layer of the peritoneum. They are observed in old hernial sacs; rarely, as compared with the pleura, on the parietal, but very frequently on certain portions of the visceral plate of the peritoneum, owing to the hyperæmia which takes place here, as, for instance, in the case of the spleen. This tissue also occurs in the subserous cellular tissue of the uterus and its appendages, and on the colon in the shape of a fibroid growth; in the former case, it reaches a considerable magnitude; in the latter, it rarely exceeds that of a lentil or a pea.

c. Anomalous osseous tissue—is developed from the above-mentioned tissue in the shape of compact, smooth, or uneven lobulated plates of varying thickness. The fibroid growth in the subserous cellular tissue of the intestinal canal is very rarely the seat of ossification.

d. Tubercle.—Tuberculosis of the peritoneum occurs in the various forms of which we gave a general sketch when treating of the tubercular disease of serous membranes, both as an acute and as a chronic affection.

It is very frequently found in the circumscribed form on those parts of the peritoneum which correspond with tubercular ulcers of the mucous membrane; and we here trace all the forms peculiar to peritoneal tuberculosis generally. It commonly does not appear until the secondary tubercular infiltrations have extended from the inner surface of the intestinal tube into the muscular coat, and thus involved the tissue of the peritoneum itself.

The tubercular exudations on the peritoneum likewise give rise to all the adhesions we have above spoken of, generally producing a more intimate agglutination between the viscera. Peritoneal tuberculosis occasionally appears as a primary affection, the peritoneum being the first tissue attacked by tubercular deposit; but it occurs more frequently after the cachexia has been evidenced by tuberculosis of another organ. Thus it allies itself to pulmonary, intestinal, and cerebral tubercle, and it very commonly terminates in tubercular affections of the abdominal lymphatic glands, and in the female sex more particularly in tuberculosis of the uterine and vaginal mucous membrane. The acute forms of peritoneal tuberculosis are, in most cases, complicated with a corresponding affection in the spleen, the liver, the kidneys.

The reflected action upon the adjacent muscular fibre, which occurs in peritoneal inflammation, is presented to us in a much higher degree in the tubercular exudative process. We find that the intestinal coats, in addition to being tumefied, become very friable; there is increased exhalation from the inner surface of the intestine, and liquefaction of its contents, the muscular coat becomes pale, is easily lacerated and broken up, and even the muscles of the abdominal parietes waste and lose colour.

Peritoneal tubercle, and especially the granulated variety, rarely passes into the stage of softening; when it does so, it may cause tubercular suppuration or peritoneal phthisis, and consequently phthisis of other adjacent tissues; cretification is a still more unusual occurrence, but the tubercular disease frequently becomes stationary.

e. Carcinoma.—The peritoneum is either secondarily affected by carcinoma, a cancerous growth originally generated externally to it, approaching and involving it in its metamorphosis, perforating it and penetrating into its cavity; or the carcinoma is produced without such antecedents, though commonly occasioned by a carcinomatous affection in the neighbourhood, in the vicinity of which it is formed; or, lastly, it occurs in some rare cases, altogether independently of such causes, as a primary affection of the peritoneum. It must, therefore, with the exception of the last-mentioned unfrequent case, be considered as the product of cancerous cachexia which has already found a nidus and a local habitation.

The most common form of carcinoma, into which, however, the other carcinomatous growths, which give rise to its appearance on the peritoneum, usually degenerate, is the areolar, and, second in order, the medullary species.

The former appears as a hard, crystalline, transparent, and discrete cancerous follicle, resembling tubercle, and of the size of a hemp or millet seed; in the acute variety it is generally thickly sown over a large extent, and even spreads over the entire peritoneum, or it occurs as a layer of areolar cancerous tissue, varying in thickness, or as a circumscribed, round, lobulated aggregation. The omentum is very commonly found to shrivel up and to degenerate into a transverse band, or, in the opposite case, with an enormous increase of size, into areolar cancer.

Medullary carcinoma frequently occurs in the acute form, as the white or coloured (melanosis) encephaloid variety, either deposited in layers, or more commonly as compressed, rounded, medullary nodules, of different dimensions.

In the fibro-carcinomatous degeneration of the peritoneum and its subserous cellular tissue, which occasionally extends over the entire peritoneum, we invariably perceive an atrophy and condensation of the tissues, and, in consequence, a contraction of the carcinomatous folds of the peritoneum, e. g. in the mesentery.

Peritoneal cancer is commonly complicated, in the manner above described, with gastric, intestinal, and ovarian cancer, and then also with uterine and hepatic cancer, the medullary form prevailing in the latter case. We must not omit to allude, at this place, to the nodulated retro-peritoneal cancerous formations of Lobstein, which commonly take their origin in the glands of the lumbar plexus or other subordinate portions of the absorbent system, and which extend into the mesentery.

§ 5. *Morbid Contents of the Peritoneal Cavity.*—In reference to this subject we may direct the reader to the preceding remarks, to the general investigation of the abnormities of serous membranes, and to subsequent paragraphs. At this place, we merely allude to the presence of gas (meteorismus abdominalis) and of serous fluid (ascites) in the peritoneal cavity. The former occurs in rare cases as a joint product of the inflammatory process, or as the result of decomposition affecting an exudation of low vitality, and in extremely rare cases as the product of a deranged secretion; but it is more frequently a mere extravasation of intestinal gas, resulting from rupture, gangrene, ulceration, or softening of the stomach or intestine.

Extensive accumulation of serous fluid gives rise to ascites. It is very often the result of an hydropic cachexia, dependent upon a variety of causes, and is then commonly associated with other dropsies. In the first instance, the predominant hydropic symptom is mostly the consequence of granular liver, heart affections, frequently of Bright's disease of the kidneys; it accompanies carcinomatous formations on the peritoneum, &c.

SECT. IV.—ABNORMITIES OF THE STOMACH.

§ 1. Original arrest of development of the stomach, involving at the same time a large portion of the intestinal canal is found in very imperfect monstrosities, and more particularly in acephalous fœtuses,—the stomach is occasionally absent in individuals otherwise normally built and provided with a well-developed intestinal tube, or it may only be indicated by a small saccular dilatation of the œsophagus.

§ 2. *Deviations of Size.*—Congenital malformations belonging to this class, are either unusual enlargement, or unusual diminution of size; the latter peculiarly affecting the female sex.

Either of these conditions, but chiefly the abnormal increase in size, occur likewise as acquired diseases.

Dilatation of the stomach is either spontaneous, or it is caused by stenosis. The former variety presents a uniform increase of size, and sometimes acquires such a surprising extent, as to fill the entire abdominal cavity. Repeated repletion, in consequence of a morbid appetite, may give rise to this development, or it may occur as a result of paralysis from concussion, traction, or dislocation produced by large scrotal herniæ, and it kills slowly with vomiting, with or without gangrene of the mucous membrane, under symptoms of complete paralysis.

Dilatation from stenosis varies according to the seat of the latter. In common stenosis of the pylorus, it is mainly developed at the splenic portion; it equally reaches an enormous degree, and proves at last fatal by paralysis. When stenosis occurs at a different spot, more or less considerable saccular dilatations take place in other sections of the stomach, and in different directions.

A diminution of the stomach is sometimes produced as a permanent condition in consequence of an insufficient supply of nutriment; in other cases it is the consequence of textural disease, especially that produced by cicatrization of extensive ulcers. Contractions or stenoses are the result of hypertrophy of the gastric membranes, of carcinoma, particularly when occurring at the pylorus, and of cicatrization after ulcerative destruction of the tissue at this and at other points.

In reference to the thickness of the parietes of the stomach, we may observe, that extreme thickness, not connected with degeneration of the tissues, is the immediate consequence of the hypertrophy of one, or more commonly of both, of the internal coats. The pyloric region is chiefly liable to the affection, which is sometimes limited to the annular portion; it is developed to a greater extent when resulting from stenosis of the pylorus, accompanied by the above-described dilatation, and it then affects mainly the muscular fibres. Hypertrophic disease of the pylorus must be carefully distinguished from carcinomatous thickening.

Attenuation of the gastric coats not unfrequently occurs at the fundus, in consequence of extreme dilatation of the stomach resulting from stenosis of the pylorus. The thinning which occurs as spontaneous atrophy, or tabes, with or without an accompanying change in the capacity of the stomach, is of greater importance; it is a very rare and tedious disease, but one which we have invariably seen associated with universal tabes, and with atrophy of the lungs (emphysema senile) and the heart.

§ 3. *Deviations of Form.*—Among these we reckon, first of all, those rare congenital malformations of the human stomach, in which an annular contraction divides it into a cardiac and pyloric stomach, or in which two or three such contractions form three or four sacculated divisions, and thus cause a resemblance to the stomach of ruminants. We distinguish these from the contractions produced during the agony of death, by the fact that the latter may be removed by inflating the stomach.

Similar and various other malformations are observed as acquired conditions; they have their origin mainly in loss of substance and in cicatrization of the so-called perforating gastric ulcer, and we shall recur to the subject when we discuss the latter.

§ 4. *Deviations of Position. Congenital.*—Position of the stomach external to the abdominal cavity in eventration, and in umbilical hernia; in the left side of the thorax, the diaphragm being wholly or partially absent on this side; vertical (fœtal) position, with the pylorus downwards; the position of the fundus, in the right hypochondrium, corresponding to the reversion of the formative type in lateral translocation. *Acquired.*—Protrusion of the stomach, externally, in consequence of extensive penetrating wounds, or into the thorax, after injuries to or rupture of the diaphragm; the position of the stomach in large hernial sacs, especially of umbilical and scrotal hernia; the dislocation of the stomach from its natural position by enlargement of the organs in its vicinity, by morbid products, by effusion into the peritoneal cavity, by traction of the omentum and transverse colon; lastly, the spontaneous sinking of the entire stomach into a lower abdominal region from increase of volume or weight, as in the case of a scirrhous pylorus.

§ 5. *Solutions of Continuity.*—We merely allude here to those rare occurrences of wounds of the stomach produced by penetrating instruments, and by firearms, occasionally healing up with a fistulous opening, and to those circumscribed separations of the membranes of the stomach from one another, accompanied by extravasation of blood, which occasionally result from concussion.

§ 6. *Diseases of the Tissues.*—As we have already treated of the diseases of the peritoneum, we shall now discuss those of the gastric mucous and submucous tissues, and the consecutive affections of the muscular coat of the stomach.

1. *Inflammation. a. Catarrh of the gastric mucous membrane* (*gastritis mucosa*).—The opportunity of observing the first stages of the genuine acute catarrh of the gastric mucous membrane, of the gastric-saburral, gastric-bilious, and allied conditions, in the dead subject, is rarely, if ever, offered; we

see the blennorrhagic stage, chronic catarrh, and the occasional acute exacerbations of the latter, more frequently.

The latter is developed from repeated active hyperæmia, or from lasting mechanical hyperæmia, and the gastric catarrhs observed in gourmands, and especially in drunkards, and, accompanied by ulceration, and by the formation of morbid products in the stomach in chronic heart disease, or in pulmonary phthisis, are particularly remarkable. The latter are generally complicated with catarrh of the entire intestinal tract, and with bronchial catarrh.

The anatomical signs of this condition are, a dark, reddish-brown, or slate-gray, or even blackish-blue discoloration of the mucous membrane, copious secretion of a stone-coloured, occasionally glassy pituita, thickening, increased condensation and induration, i. e., hypertrophy of the mucous membrane, which presents itself in various degrees:

α. In the lowest degree, the mucous membrane shows simply an increase of thickness and hardness in its tissue;

β. In a higher degree, it presents, in addition to its increased thickness, an uneven, racemose, or warty surface, a *surface mamellonée;*

γ. In a still more advanced degree, it forms prolongations in the shape of permanent, firm folds, or of polypus.

The submucous cellular tissue, and the muscular coat, also participate in this hypertrophy in various degrees—the entire parietes of the stomach presenting unusual thickness, firmness, and hardness.

The pyloric portion is the chief seat of chronic catarrh, and it is there that hypertrophy of the mucous and other membranes is most prominent.

b. Croupy inflammation.—This form never occurs as a primary and substantive affection except in the shape of delicate flocculent exudations in the aphthous process of children, but always, and even that rarely, as a sequela or degeneration of exanthematic processes, in variola, in typhus, in the absorption of pus into the circulation, and particularly in puerperal inflammation of the uterine veins. The false membrane which sometimes invests the entire stomach, presents a very regular areolar surface.

The operation of tartic emetic upon the gastric mucous membrane may produce a similar process, it is however commonly limited to a few streaks.

c. Inflammation of the submucous cellular tissue.—Idiopathic inflammation of the submucous cellular tissue of the stomach, resembling pseudo-erysipelas, and passing on to suppuration, is a very rare phenomenon; it not unfrequently occurs as a secondary process, analogous to the metastases of specific, acute dyscrasiæ. The parietes of the stomach appear thickened; the stratum of submucous tissue is distended with pus; it is soft and friable; the superincumbent mucous membrane is reddened, and, at intervals, tense. After a time it gives way at these points, and, by numerous irregular cribriform openings, the pus exudes into the cavity of the stomach.

d. The process, which is caused by the operation of caustic substances on the membranes of the upper part of the alimentary canal.

We limit ourselves to a statement of the *modus operandi* of the more common substances which are taken accidentally, or are administered as poisons, such as the mineral acids, and especially the sulphuric acid of the shops, and white arsenic, and give the results afforded by numerous post-mortem examinations.

The effect of the mineral acids generally extends over the cavity of the mouth and fauces, the gullet, the œsophagus, the stomach, and occasionally beyond the latter; sometimes it is limited to the former, so that scarcely a trace is visible in the stomach.

In reference to the intensity of the effect which may cause superficial or deep mortification of the tissues with greater or less rapidity, we distinguish several degrees. The effect is influenced by the quantity and the strength of the liquid, and the duration of the period during which it remained in contact with the parts alluded to. We generally find the effect to be less intense in the cavity of the mouth and fauces, more marked in the œsophagus, and, provided an appreciable amount of acid reached the stomach, most powerful at this point. In the lowest degree the effect is limited to destruction of the epithelium. The mucus of the mouth and the fauces contains flocculent coagula; the epithelium is converted into a thick, grayish-white, rugose layer; it peels off here and there, and the subjacent mucous membrane is pale.

In an advanced degree, the superficial layers of the mucous membrane of the fauces and œsophagus, under the destroyed epithelium, are found corrugated, of a dirty, whitish, leaden hue, and the capillary network blackened by its carbonified contents. The lower strata of the mucous membrane, and the submucous cellular tissue, present serous infiltration. In the follicles at the root of the tongue, the mucous secretion is coagulated into dirty white masses.

In a still higher degree, the entire mucous membrane is destroyed, and converted into a dirty gray mass, which is traversed by black vessels; the submucous cellular tissue is infiltrated, and partially ecchymosed; the muscular coat of the œsophagus itself is shrivelled, pale, ashy.

In the highest degree, the mucous membrane of the œsophagus, together with the submucous cellular tissue, is converted into a soft, black mass, which is distended by a sanguinolent fluid, and is easily detached from the muscular coat. The latter is itself either destroyed in the same manner, or is perfectly colourless, friable, and presents an ashy, gelatinous appearance.

The mucous membrane of the stomach almost invariably suffers the changes of the third degree, though in varying extent and thickness. It is either affected in single folds, or streaks which pass from the cardiac orifice to the lesser curvature, and from the large curvature to the pylorus; or over a large extent; or we find the entire surface converted into a black carbonaceous mass, of several lines in thickness, distended by sanguinolent fluid, and consequently presenting a tumefied appearance. The muscular coat is altered in the manner peculiar to the third degree, and we therefore often find the parietes of the stomach perforated.

The acid affects the neighbouring organs through the membranes, and thus either coagulates or tans the contained fluids, fuses the tissues into a gelatinous mass, or carbonifies them; the discoloration produced is always very marked. In many cases, not only the blood of the neighbouring blood-vessels, but also of the larger trunks, and even of the aorta, is changed into pultaceous, pitchy, greasy, black cylinders. Beyond the stomach, and especially in the duodenum, and at the commencement of the jejunum, the effect of the lowest degree is exhibited in coagulation of the intestinal mucus, and of the chyle, in corrugation and opacity of the epithelium, in the tanned state of the mucous membrane, and the dark injection of its vessels. The consequences and results are modified according to the intensity of the operating influence.

The highest degrees, in which, generally, a very extensive surface is involved, produce a rapidly fatal termination. The lowest degrees are followed by exudative inflammation; the mortified epithelium sloughs, and being replaced by a new formation as soon as the reaction has abated, recovery ensues.

In all the higher degrees we have reactive inflammation in the healthy tissue, which effects the rejection of the superincumbent mortified tissue by passing into suppuration. As the inflammatory and suppurating processes diminish, the tissues contract, cicatrices form, and a cure results; or suppuration is protracted, causing a late recovery, or ending fatally in œsophageal phthisis.

According to the depth to which the tissues are destroyed, the loss of substance is repaired under a formation of strictures, that vary in size and consistency.

If the mortification be limited by the submucous cellular tissue, we shall find the latter condensed over the pale, ashy, muscular coat, which now resembles the elastic tissue, into a serous, or fibro-serous, tissue, replacing the mucous membrane to a considerable extent. This tissue forms, at some places, projecting ridges, or valvular, and even annular, duplications towards the œsophagus; and we thus have a peculiar membranous stricture of the latter produced, not unlike the strictures found in dysentery.

If the muscular coat itself is involved, it is partially or entirely destroyed, and the walls of the œsophagus are converted into a fibro-cellular firm tissue, which contracts, and thus produces the most important and most resisting strictures.

These strictures are formed chiefly, though not exclusively, at the lower section of the pharynx, posterior to the cricoid cartilage, and in the vicinity of the cardiac portion. We also not unfrequently see, besides these strictures, solitary insulated remains of the mucous membrane on the inner surface of the œsophagus, in consequence of the contraction of the new tissues. They have a shrivelled appearance, and are in part detached, or form transverse bands.

A torpid suppurative process is commonly the result of a more profound injury, and is seen in the shape of abscesses and sinuses of the muscular coat, and of the condensed cellular sheath of the œsophagus. When it ceases, it invariably leaves very considerable contraction of the tissues and strictures of the kind last described; ulcerative perforation of adjoining passages (trachea, bronchi) may follow; death frequently ensues from phthisis, or by exhaustion from dysphagia.

The same occurrences may, though less frequently, be observed in the membranes of the stomach.

The operation of arsenic is limited to the mucous membrane of the stomach, but it frequently produces no local effect; and this is particularly the case where the symptoms of poisoning and death follow rapidly after the introduction of small quantities. When present, it is an exudative inflammatory process, accompanied by softening and sloughing. At one or more points, to which a white pulverulent substance (arsenic) happens to attach itself to a larger amount, the mucous membrane appears plicated and tumefied, reddened, invested by a detached epithelium, and a tawny exudation; its tissue is softened, pultaceous; and at the spot where the white grains of arsenic are attached, it is converted into a yellowish or greenish-brown slough. Between these solitary foci, from which reddened folds of the mucous membrane proceed, the inner surface of the stomach presents at many parts a perfectly normal structure.

2. *Ulcerative processes.*—The ulcerative loss of substance which results from one or the other of the processes we have hitherto considered, requires no separate examination, as it presents nothing characteristic. There are other ulcerative affections of the stomach which appear of more importance. Those connected with tubercular and cancerous affections we shall examine under the head of tubercle and carcinoma. At present we consider the following:

a. The perforating ulcer of the stomach.—There is one kind of ulcer that occurs in the stomach, which, both on account of its frequency, and on account of the extreme pain it causes, as well as on account of the numerous and enigmatical symptoms that accompany it, deserves every attention,—an ulcer, termed by Cruveilhier the simple chronic ulcer of the stomach, and which we would call the perforating gastric ulcer, from its prevailing tendency to perforate the parietes of the stomach.

In a well-defined case there is, in the region of the pylorus, a circular orifice of from three to six lines in diameter, with a sharp peritoneal edge, as if a round piece of the gastric parietes had been punched out. When viewed from within, the loss of substance on the internal membranes of the stomach, and especially on the mucous layer, appears more considerable, so that the edges of the hole seem bevelled off from within outwards. There is no further morbid appearance beyond a thickening of the parietes in the immediate neighbourhood of the ulcer, and a tumefaction of the gastric mucous membrane.

The pyloric half of the stomach is the seat of the ulcer; it is most frequently found in the middle zone of this portion; it is oftener seen at the posterior than at the anterior surface, almost always near to, and frequently at, the lesser curvature; and it occurs, in extremely rare cases only, at the fundus. This affection may also appear beyond the stomach in the upper transverse portion of the duodenum, but it does not occur in the remaining portion of the intestinal canal.

The size of the ulcer varies from that of a sixpence to that of half-a-crown, and even to that of a cheese-plate.

Its shape is commonly circular, but, in exceptional cases, it is from the beginning of an irregular form, though the circular form with which it commences frequently disappears subsequently. Ulcers of great extent approach the elliptical shape; but, on further extension, this too is lost, and they become irregular in consequence of the formation of sinuses varying in depth. The extension of the ulcer in the transverse diameter of the stomach, so as to form a zonular ulcer, is singular, on account of the deformity of the stomach which follows. The original form of the ulcer is also lost, when two ulcers coalesce so as to form a single one. In these cases we may for a long time be able to point out the boundaries of each, represented by a ridge of cellular tissue, but this, too, will disappear, and they then both have the same common base.

In the majority of cases there is only a single ulcer, but frequently there are two or three, occasionally four or five, and these are then commonly placed above or near to one another at the posterior surface of the stomach, or at the lesser curvature. It is very rarely the case that one occurs at the posterior, and the other at the anterior surface of the stomach, or that two ulcers are formed opposite to one another in the duodenum.

It has not been clearly ascertained in what shape the malady takes its origin, and in what manner the further development is effected. It is probable that it commences with an acute, circumscribed, red softening (hemorrhagic erosion), or with a circumscribed sloughing of the mucous membrane; it is still more probable that the ulcer increases in this manner, the tissues at the base of the ulcer sloughing and exfoliating layer by layer. We have observed this occurrence in a few solitary instances, and we would therefore view the process as offering a valuable analogy to sloughing of the lungs (gangræna pulmonalis); on the other hand, we cannot admit that view to be well grounded, which explains the loss of substance in question solely by the absorptive process; the callosities of the surrounding tissues, and the well-marked reaction at the base, are in themselves sufficiently strong arguments against it.

The ulcer attacks the deeper-seated parts in a peculiar manner, when it presents the perfectly round form. The loss of substance is most extensive in the mucous membrane; if the muscular coat has been attacked and destroyed, we find a smaller ring with sharp edges, and the ulcer thus obtains a peculiar scarped appearance. If, finally, the peritoneum is perforated, this point will occupy the centre of the circle; the serous membrane will be converted into a yellow slough, and it will tear, or be voided.

This process may run an acute course; but it is commonly chronic; occasionally it comes to a standstill, and then again exacerbates in an acute or chronic form. A cure may result at any of the stages, as proved by the various cicatrices frequently observed on the inner surface of the stomach. Even actual perforation of the stomach is frequently rendered innocuous by the adhesion of neighbouring organs, and complete cicatrization may follow.

Loss of substance in the mucous membrane alone is repaired by a condensation of the submucous cellular tissue into a fibro-cellular tissue, which causes the edges of the mucous membrane to approach one another, and is finally blended with it and the muscular coat. A radiated, asteroid scar, varying in size, remains.

When the ulcerative process has involved the muscular coat, and has penetrated beyond it, the muscular fibres that edge the ulcer retract beyond the mucous membrane, the subserous cellular tissue and the peritoneum shrivel up, the walls of the stomach forming the bases of the ulcer, and now only consisting of these two layers, are doubled inwards, the divided portions of the mucous membrane are thus brought together, and a union is gradually effected. We then find corded cicatrices, which shorten the stomach in its transverse diameter, or form annular contractions proportionate to the extent of substance destroyed or to their position. The pylorus is particularly liable to a diminution of its caliber.

Perforation and its temporary or permanent cure, demands a more minute exposition.

If it takes place at a portion of the stomach, which, like the greater part of the anterior gastric parietes, but rarely enters into a protective adhesion with neighbouring tissues, perforation allows the contents of the stomach to pass freely into the peritoneal cavity, and fatal peritonitis follows.

This result is frequently prevented. Whilst we find the tolerably uniform irritation within, giving rise to hypertrophy of the mucous membrane and to callosity of the base of the ulcer and its circumference, we see at the corresponding points of the peritoneal surface, cellular adhesions, or a more intimate union between the stomach and the reverted omentum, the left hepatic lobe, or the pancreas, produced by repeated, circumscribed, inflammatory attacks. The cellular adhesions which have been effected between the stomach and the omentum, and are sometimes found to unite the former with the left lobe of the liver, are not sufficient to prevent a fatal issue when perforation occurs, for as soon as this event has taken place, the adhesions inflame,—this, and the forcible expulsion of the gastric contents, loosens and tears them, and thus the inflammation spreads to the peritoneum, both by continuity of tissue, and by direct contact. The perforation will be rendered more permanently innocuous by intimate adhesion, viz., by the agglutination of a fibro-cartilaginous exudation; as this tissue offers to the contents of the stomach, both from its density and its thickness, a sufficiently firm resistance. This frequently occurs between the small curvature, or the anterior surface of the stomach, and the concavity of the left lobe of the liver and very frequently between the posterior gastric surface, the pancreas, and the adjoining lymphatic glands; but very rarely between the posterior surface of the stomach and the spleen, after the latter has been dragged into that position, or between the stomach and the diaphragm (Abercrombie, Chardel). In such cases, after the external membranous layers have been destroyed to an extent proportionate to the loss of substance, the mucous membrane is invariably doubled back over the edge of the perforating ulcer, and impinges upon the pseudo-membranous agglutinating tissue external to the stomach; thus the orifice in the gastric parietes is never filled up by the superimposed tissue in such a manner as to be flush with the inner surface of the stomach, or even to project beyond it into the cavity of the latter.

In favorable but rare cases the pseudo-membranous tissue contracts and draws the edges of the orifices together, so as to produce a firm, callous cicatrix.

In other instances this does not occur; the cavity, though covered in as described, remains, and particularly when adjoining the pylorus, in consequence of the *vis a tergo* of the gastric contents, enlarges into a lateral sinus, which is lined by the false membrane.

Although in the majority of cases a free opening of the stomach is thus prevented, we may even here find exceptions; the soldering tissue may itself gradually be consumed, the adjoining organ is laid bare, and becomes exposed to an extension of the process. Thus we have seen one case in which the adjacent diaphragm, which had formed a plug, was perforated from the stomach, and the base of the adhering lung was attacked.

In the progress of the perforating gastric ulcer a very important occurrence frequently supervenes, viz. hemorrhage, which often kills on the first, but more frequently after repeated attacks. So long as the ulcer has not perforated the walls of the stomach, the loss of blood is inconsiderable, as the process involves only the small vessels of the membranes, which are easily plugged up. But as soon as the ulcer has penetrated through the gastric parietes, it meets with larger vessels in and beyond the pseudo-membranous layer, or with the vascular system of the obturating organ. Thus, the trunks of the splenic, the coronary, the pyloric, the gastro-epiploic, the gastro-duodenal arteries and their branches, and more especially those going to the pancreas, are corroded and opened, and exhausting and fatal hemorrhages ensue.

Blood-vessels are not alone involved in the destructive process, but other canals also, and we instance the pancreatic ducts, which, in the case to which we allude, open upon the base of the ulcer, and by forming pancreatic fistulæ, oppose the complete consolidation of the imperfect cicatrix.

The ulcer not only proves fatal by perforation, with consequent peritonitis and hemorrhage, but also, though rarely, by exhaustion from dyspepsia and harassing cardialgia. It is invariably accompanied by chronic catarrh and blennorrhœa of the gastric mucous membrane; it heals as we have remarked, very frequently, but it as often recurs. The cure of large ulcers is followed by considerable deformities of the stomach, and more especially by shortening of the posterior wall and the lesser curvature, or by annular strictures. The disease occurs chiefly at the period of puberty, and very often, particularly in the female sex, as early as the 15th year.

The perforating gastric ulcer is in no way connected with gastritis and cancer, though it is often mistaken for these affections; but it is important to know, though it be for the mere cadaveric diagnosis, that in rare cases it may be complicated with cancer; yet it always retains its peculiar characters so as to be distinguishable in the midst of the cancerous growth and devastation.

b. Hemorrhagic erosion of the gastric mucous membrane.—Very frequent opportunities are presented to us of observing loss of substance accompanied by bleeding, in the mucous membrane of the stomach. There are round or roundish spots of the size of a pin's head or a pea, or narrow, elongated streaks, at which the mucous membrane appears dark red, lax, soft, bleeding, and presenting a depression in consequence of loss of substance or slight erosion.

Commonly a dirty brown coagulum is attached to the point, and the nature of the derangement only becomes evident after the coagulum has been removed. Sometimes this loss of substance involves the entire thickness of the mucous membrane and the submucous cellular tissue, and produces an appearance of small, round, or striated ulcers.

This process is invariably accompanied by hemorrhage; the gastric mucus, which generally is present in considerable quantity, presents streaks of discoloured blood, proportionate to the number of diseased points, or it shows a copious admixture of brown flocculi or debris, or we find an accumulation of fluid in the stomach, resembling coffee-grounds. The entire mucous membrane is found in a condition of recent or inveterate blennorrhœa and catarrh, and in the vicinity of the erosions it is often tumefied so as to form a vallated circumference.

The number of these erosions varies; it not unfrequently happens that the stomach, with the exception of the fundus, is closely studded with them, and is marked with red or brown spots, according to the colour of the adherent coagula.

They occur at every period of life—they are seen even in the infant, and they are found chiefly at the pyloric portion, i. e. in that part which is the chief seat of the catarrhal process. The follicles, or the glandular apparatus of the gastric mucous membrane (Cruveilhier's gastritis folliculosa), appear to be their occasional nidus.

This inflammation and erosion undoubtedly occur sometimes as an idiopathic affection. They are more commonly developed consequent, or attendant upon the most diverse, acute, and chronic diseases, so that no definite conclusion as to the real nature of the process, and as to its connexion with other affections, has yet been arrived at. An acquaintance with the facts is of considerable importance, though it only serves to assure us that the disease is idiopathic, and in no way allied to the erosion produced by caustic substances.

3. *Softening of the stomach.*—We must distinguish *two* primary forms of softening, which present essential differences in numerous points; both however are to be carefully distinguished from cadaveric softening, the self-digestion of the stomach.

The one, a disease of infant life, is called *gelatinous softening.*

It appears to be a metamorphosis—a softening—of the mucous membrane of the fundus, which extends to the muscular coat and the peritoneum, converting them and the intervening interstitial cellular tissue, into a grayish or grayish-red transparent jelly, with a yellowish tinge, through which single dark-brown streaks, the broken-down blood-vessels, are observed to pass. Inasmuch as the softened inner strata occasionally become detached, the fundus of the stomach may be found to consist of nothing else but thin, gauze-like, friable portions of the peritoneum.

The softened portion of the stomach tears at the slightest touch; it dissolves between the fingers, and perhaps in rare cases these rents occur during life, but probably oftener after death, giving rise to effusion of the gastric contents into the abdominal cavity.

The process is not, however, limited to the stomach, but frequently extends to the neighbouring tissues, and chiefly to muscular organs, and especially to the diaphragm. Here too, perforation is the final result, and with it there is effusion of the gastric contents into the left pleura.

Gelatinous softening of the stomach commonly runs a subacute course: general anæmia, which is particularly apparent throughout the intestinal canal, and general collapse and wasting, which are chiefly evident in the muscular tissue, are constant accompaniments of this disease. It is frequently founded upon a demonstrable affection of the brain, principally hypertrophy, or hydrocephalus; and this fact renders it probable that there is a similar causative nexus in those cases also, in which no visible anomalies have been hitherto detected in the infantine brain. Perhaps the proximate cause may be looked for in diseased innervation of the stomach, owing to a morbid condition of the vagus, and to extreme acidification of the gastric juice.

Nevertheless, the *quæstio vexata* as to the origin of the affection in irritation or inflammation remains. If we consider, in addition to the above remarks, the uniform localization of the disease, that in none of its stages it presents, either at the point of softening or in its vicinity, hyperæmia, injection, or reddening, and that we are still less able to demonstrate upon the inner surface of the stomach, or in the tissue of its coats, the products of inflammation, we are constrained to infer the non-inflammatory nature of the affection. This conclusion gives a key to the various kinds of softening that occur at advanced periods of life under similar circumstances, viz., in cerebral affections.

A second form, in which softening of the stomach takes place, is distinguished by an absence of pallor in the softened tissues, or rather by their colour. The parietes of the stomach are converted into a more or less saturated dark brown, or blackish pulp.

It occurs under two different circumstances, though in both the process has an acute character, and in both the colour of the softening tissues is produced by an alteration of the blood contained in them, by an acid. They differ essentially in their genetic relations.

In the first instance, it occurs, both in children and adults as a sequela of acute affections of the brain and its membranes, and more especially of tubercular meningitis at the base of the brain. It is the same process as gelatinous softening of the stomach, and the theory to which we have alluded is the more applicable the more fully the affection at the base of the cerebrum is developed. But the development takes place with the greater rapidity, the less the acute disease of the brain has induced that degree of anæmia which commonly prevails in gelatinous softening; and, the tissue being still more or less injected, the superabundant acid acting upon the contained blood, produces the characteristic discoloration. The solitary fuliginous streaks above alluded to, as occurring in the pale, jelly-like membranes of the stomach, are analogous to this condition. Besides it not unfrequently presents itself in those cases of pulmonary paralysis which are probably caused by a reflex action of the œsophageal and gastric branches of the vagus.

In the second instance, the softening occurs, unconnected with the etiological relations we have hitherto discussed, under totally different circumstances. We now speak of it as a sequela of certain cachexiæ, which were either originally acute, or became so under the influence of certain circumstances, viz., the exanthematic, the croupy, the typhoid in the widest senses, pyæmia, acute tuberculosis, acute cancer—it is then to be viewed as a fatal degeneration of these diseases. This form is developed from a congestion in the capillary network of the gastric membranes, and particularly of the mucous membrane of the fundus, which is generally accompanied by a more or less congested state of the spleen. It probably arises from the state of the blood itself which accumulates with an excess of acid in the vascular system of the fundus, and of the spleen. This too is the cause of the generally rapid course of the affection, the dark colour of the softened tissues and their frequent perforation. It commences with a dark brown or black discoloration of the mucous membrane at the fundus, which is soon converted into a black pulp that may easily be detached. If it be removed or if it separate spontaneously, a pale, bluish-white, submucous cellular tissue is exhibited, in which vessels ramify whose coats are disorganized, and which contain a black (carbonified) granular coagulum. The subjacent muscular coat is pale and thin, the peritoneum dull, and of a dirty-gray colour. The process extends from the mucous membrane to the subjacent tissues; they are converted into a black, grumous pulp, and thus more or less extensive perforations result, which are bounded by a furred margin. Here, too, the diaphragm is frequently involved, and softening and perforation of this organ follow. The stomach is found to contain large quantities of a fluid resembling coffee-grounds or ink, which is often vomited during life—there is an admixture of more or less of the softened tissues, and of their fat, which floats in the mass in the shape of oil-globules. This fluid originates in the sanguineous effusion which takes place at the commencement of the disease; the latter proceeding from the vascular system, and first affecting the coats of the vessels. On the occurrence of perforation, the fluid is extravasated into the peritoneum, and into the left pleura; and it here gives rise to a similar process in the serous membrane, accompanied by the evolution of gas.

In rare cases this process only takes place at solitary, circumscribed spots, and does not then appear to run its course so rapidly. The mucous membrane disappears at these points, with the exception of a very thin, gauze-like, discoloured layer, to the edges of which are attached a few jagged remains of the former.

The fundus is the seat of all the softening processes of the stomach—from here they extend to the large curvature of the stomach, in which respect they differ from the gastric diseases that we have already considered, or that we are about to examine, such as catarrhs, follicular erosions, the perforating ulcer, hypertrophy, cancer. It is there too that we find the perforations; and it is only in very rare cases that we see softening at the large curvature precede the development of softening at the fundus.

Softening, and especially the last-named form, occurs in company with softening of the fundus at the œsophagus. The lower third of this tube is liable to be attacked, and the side which is directed towards the left side of the thorax is chiefly so, as the perforations almost invariably occur here, producing effusions into the left half of the thorax, after the cellular sheath of the œsophagus and the mediastinum have been absorbed.

The softening is never distinctly circumscribed, but is shaded off gradually into the surrounding tissues. It is a fact of considerable importance, that softening may take place after death from the operation of cadaveric, chemical changes, which closely resemble the processes we have just described. It is not always easy to decide between this self-digestion and morbid softening; nay, it is a matter of impossibility for the conscientious pathologist, unless he take the previous disease and the mode of death into consideration.

The following circumstances may, however, serve to characterise cadaveric softening:

a. The absence of all symptoms during life which indicated softening, or the morbid processes that gave rise to it.

b. Sudden death, from natural or other causes, during the digestive act, whilst the stomach is filled with chyme, without previous illness.

c. Limitation of the softening to the mucous membranes, and especially to the projecting folds, so as to form streaks.

d. And at the same time its extension beyond the ordinary boundaries of morbid softening—its development being most remarkable at those points at which there is a stagnation of the greatest quantity of the gastric contents.

4. *Heterologous formations. a. Anomalous occurrence of fatty tissue, of lipomatous tumours between the gastric membranes, and chiefly in the submucous cellular tissue.*—These growths

project into the cavity of the stomach, being either attached by a neck or sessile, and being invested by mucous membrane. Occasionally they pass through the fasciculi of the muscular coat, and present similar tumours under the peritoneum.

b. Anomalous fibrous and fibro-cartilaginous tissue—appears chiefly in the vicinity of cardiac orifice and the lesser curvature, and assumes the shape of flattish, rounded, whitish, tough concretions in the cellular tissue, which are moveable and of the size of a lentil or pea.

c. Erectile tissue—is either developed at the free end of polypi, or the mucous membrane degenerates into it on a larger surface, upon which the erectile tumour is attached by a broad base or only by a very short neck or stalk. It is the common seat of encephaloid infiltration.

d. Tubercle and tubercular ulceration of the stomach—are a very rare occurrence, and primary tuberculosis of the stomach is almost unknown. It commonly occurs as a result of intestinal tuberculosis which has advanced to an extreme degree; the tubercular ulcers extend from the ileum through the jejunum and duodenum into the stomach. They here are generally limited to the pyloric portion, but sometimes extend to the fundus. The remarks we shall have to make on intestinal tubercle apply also to the original seat of tubercle and the character of the tubercular ulcer in the stomach. In the former, the mesenteric, in the latter, the lymphatic glands are the seat of tubercular affections, and we may use this as an aid to the diagnosis of a gastric ulcer, the characters of which may not otherwise be sufficiently defined.

e. Carcinoma.—Carcinomatous diseases affect the stomach very frequently, and carcinoma of the stomach is moreover the most common carcinomatous disease of the digestive tube. It must be carefully distinguished, as we shall have occasion to explain more fully, from mere hypertrophy, the non-malignant thickening of the gastric membranes, with which it is sometimes confounded.

We find all the different species of carcinoma, the fibrous, the medullary, the areolar, occurring at this point; though in various degrees of frequency. Fibrous cancer is the most common, the pure genuine medullary cancer less so, and the areolar variety is very rare. Often enough we find the first two, and sometimes all three, occurring in primary, but more particularly in secondary, combination.

a. Fibrous cancer appears as thickening of the submucous cellular stratum, which congeals into a resisting, whitish, fibro-lardaceous mass, and unites intimately with the mucous and the muscular coats. The latter becomes pale, and gradually undergoes a change which is characteristic of all kinds of cancer. It increases in thickness, and at the same time degenerates into a pale-yellowish-red areolar tissue, the interstices of which are filled up by a slightly translucent and apparently crystalline substance. The increase of the muscular coat is uniform, whereas that of the submucous cellular tissue is commonly irregular, and we thus see lobulated protuberances formed on the inner surface of the stomach.

Fibrous cancer is the one most easily and most frequently confounded with hypertrophy of the gastric coats. The distinguishing signs are, the preponderating increase of substance in the submucous cellular tissue and its want of uniformity, the accompanying cartilaginous hardness and closeness of texture, the fusion with the mucous and muscular coats, and particularly the alteration in the muscular tissue just described (John Müller).

The mucous membrane itself undergoes further peculiar changes. It sometimes degenerates into an areolar cancerous tissue, which discharges large quantities of a gelatinous mucous fluid; or it is converted into erectile tissue, as a fungoid growth, which becomes the seat of encephaloid infiltration, suppurates, and partially exposes the submucous scirrhous cellular tissue; or lastly, it most frequently becomes the seat of a sloe-black softening with hemorrhage, and we thus find the scirrhous submucous cellular tissue invested by a thin, gauze-like black remnant of the mucous membrane, or it is quite denuded, merely retaining here and there a few solitary black convolutions of vessels at its surface.

The scirrhus, too, at once becomes the seat of various metamorphoses. It may, after it has been denuded of its mucous membrane, become gangrenous in large patches or in round circumscribed spots, the tissue exfoliating by layers, so as to give rise to deep, smooth excavations in the crude cancer; or it may become developed into a more highly-organized carcinomatous formation, such as medullary sarcoma, accompanied by bleeding fungoid tissue; this is soon destroyed by a suppurative process, leaving an ulcer which is surrounded by an elevated lardaceous margin.

β. Medullary cancer of the stomach occurs independently of its secondary appearance in the metamorphosis of fibrous cancer, primarily in various forms :—

αα. In the shape of soft and even liquid, milky, medullary, infiltration of the erectile tissue, into which the mucous membrane has degenerated, the other coats remaining normal. (Vide p. 40.)

ββ. As a lardaceous, medullary degeneration of the submucous cellular stratum to a greater extent.

γγ. As knotted tumours between the gastric coats, and here too chiefly in the submucous cellular tissue.

Medullary carcinoma is distinguished in this form also, by its extensive growth, and by its rapid metamorphosis, accompanied by vascular fungoid degeneration.

γ. Areolar cancer presents, in the degeneration of the mucous and submucous cellular tissues, the characters generally peculiar to this form.

We often, as has been remarked, find these varieties of cancer occurring simultaneously; in the stage of metamorphosis in which more particularly a consecutive complication is seen, the fibrous cancer at the base gives rise to an areolar cancer, from which, in its turn, medullary cancer shoots up in the shape of a peripheral erectile growth.

The stomach is either the primary or the secondary seat of disease. In the former, the most usual case, the cancerous degeneration extends from the stomach to other organs, attacking the lymphatic glands which are contiguous to the head of the pancreas and the biliary ducts, the pancreas itself, the glands of the lumbar plexus, and, finally the fibrous investments of the vertebral column, the liver, the transverse colon, the omentum, &c. In the latter case, which is of much less frequent occurrence, the stomach is secondarily attacked, the morbid affection commencing in neighbouring tissues, and particularly in the conglomerations of lymphatic glands, from which it extends to circumscribed portions of its posterior parietes. In this variety, the cancerous ulcer may proceed beyond the stomach, establishing communications with the transverse colon or with other portions of the intestine, and it may even force its way outwards after a previous union of the stomach and the abdominal parietes has been effected, and the latter have been destroyed.

The pylorus, indifferently at all parts of its circumference, is known to be the chief seat of primary fibrous and areolar cancer of the stomach. From this point the degeneration extends chiefly along the lesser curvature over the pyloric half of the stomach; in many, though rarer cases, it affects the entire stomach, attacking the fundus last, which however generally remains partially free. The parietes of the stomach may attain an inch in thickness, being rigid and generally tuberculated on their inner surface; the cavity of the stomach will at the same time be diminished in size. The cardiac orifice of the stomach is rarely the seat of cancerous degeneration, and it is singular that cancer of the pylorus is accurately bounded by the pyloric ring, and never extends to the duodenum; whereas when cancer occurs at the cardia, excepting, of course, those cases in which it descends from the œsophagus, it invariably involves a portion of the latter.

The scirrhous pylorus is commonly bound down by the degeneration of the tissues that lie behind it; but exceptions occur which require the more to be known, as they materially affect the diagnosis. The degenerated pylorus may remain unattached, and will then, owing to its increase in weight, descend to a lower region of the abdomen, even down to the symphysis pubis, causing a hard, very moveable tumour, which easily gives rise to mistakes.

In proportion as the parietes increase in size and thickness, the stenoses of the pyloric channel will be more or less considerable; nodose protuberances, uneven contraction of the tissues and corrugation of the parietes, give rise to inflections presenting a more or less acute angle. The greater the stenosis, and the more the cancerous degeneration is limited to the pylorus, the more considerable will be the dilatation of the stomach, which sometimes reaches an enormous size, and presents a more or less hypertrophied state of its muscular coat.

It is very frequently found to contain the well-known chocolate-coloured fluid resembling coffee-grounds, the origin of which is apparent from the various conditions of the inner gastric surface we have above examined.

Cancer of the stomach in most instances is uncomplicated, but it is also found coexistent with cancer of the liver, of the lumbar glands, of the intestine, and especially of the rectum, of the uterus, the peritoneum, the ovary, &c.

§ 7. *Anomalous Contents of the Stomach.*—Among the anomalous contents of the stomach, we class, first, the secretions of the mucous membrane, which, both as regards quantity and quality, in various ways depart from their healthy condition; secondly, the products of different morbid processes which occur either in the stomach or external to it; thirdly, foreign bodies which have been introduced into it from without in a variety of ways.

To the first belong large collections of gas, of very acid gastric juice, as we find occurring in chronic gastritis and many other morbid metamorphoses of the gastric membranes, the absence, but more frequently the excess, of a white, milky, opaque, and purulent, or of a transparent, viscid, gelatinous, glassy mucus, such as we find in chronic catarrhs, or in a blennorrhoic condition of the gastric mucous membrane.

To the second belong the products of exudative processes, and of ulcers in the stomach itself, such as plastic, viscid mucus, fibrinous exudation, pus, ichor. The latter may also be introduced from without, from abscesses of contiguous organs, the liver, the spleen, the pancreas, the lymphatic glands, from ulcers of the œsophagus, and even from abscesses of the vertebræ.

Blood occurs in varying quantities; when found to a large amount either in a coagulated or fluid condition, it commonly has its source in rupture of varicose veins of the œsophagus or stomach, in rupture of an aneurism communicating with those cavities, or in corrosion of arteries lying at the base of a perforating gastric or duodenal ulcer. Occasionally, too, the capillary bleedings which accompany follicular inflammation and erosion, degenerate into such exhausting hemorrhages.

Blood may also occur as a reddish brown, or black pulverulent substance, either mixed up with the contents of the stomach, and especially with the mucous secretion, in the shape of streaks or flocculi, or attached to the mucous membrane, and more especially to the bleeding portions.

Or it may occur as a chocolate-coloured, coffee-grounds-like or inky matter, and that will be the case under all circumstances that give rise to gastric hemorrhage, if the blood has been retained in the stomach for a certain period, and submitted to the action of the gastric juice. It is evident that this will chiefly be the case in passive hemorrhages. We gather from the preceding observations that the following are the cases in which the contents of the stomach present this appearance, and in which there will be vomiting of black matter during life:

a, In slow hemorrhage from a perforating ulcer of the stomach;

b, In capillary hemorrhage accompanying hemorrhagic erosion of the gastric mucous membrane and their follicles;

c, In softening;

d, In the hemorrhages that accompany cancer of the stomach.

In rare cases we find blood in the stomach without being able to trace a distinct cause of the hemorrhage, either in or out of the organ; the parietes of the stomach are either found to be in a state of complete anæmia, or occasionally single, red, injected portions of the mucous membrane are visible, which bleed on the application of slight pressure from below, by which the congestion is increased. There is no doubt that, in such cases, hyperæmiæ of various kinds precede, and blood at once transudes through the vascular coats; the greater the impulse of the blood, the laxer the tissue and the vascular coats, and the thinner the blood itself is, the easier will this be brought about.

The blood which is found in the stomach is not only, as we have remarked, frequently the result of extravasation which has taken place external to the stomach, but it may even have been extravasated external to the œsophagus and intestinal canal. Thus it is often swallowed in large quantities during hemorrhages of the respiratory mucous membrane.

Finally, there may be bile, biliary calculi, fecal matter and lumbrici, in the stomach.

To the third class belong the most various foreign bodies which have been swallowed accidentally, or in consequence of morbid appetites; in the latter case, chiefly seen in lunatics, they are taken in large quantities, and with evident selection. We may enumerate flints, clay, indigestible vegetables, grass and straw, waste pieces of clothing; metallic substances, as coins, bullets, iron nails, pins, &c. They give rise to various lesions, to perforation of the stomach, or at least, to irritation and inflammation, with subsequent ulceration of the mucous membrane.

SECT. V.—ABNORMITIES OF THE INTESTINAL CANAL.

§ 1. *Defective and excessive Formation.*—A complete absence of the intestinal canal when an abdominal cavity existed, has probably never been observed. It is frequently defective; at times it is a short tube of uniform caliber, attached to a flat narrow strip of mesentery, or it consists of several detached portions of intestine which are strung together on a very defective fold of the peritoneum.

We must here mention the blind termination of the intestine at different points of its course, there being either a fresh acuminated commencement lower down, or an absence of the remaining portion. The most frequent anomaly is the more or less extensive deficiency of the rectum with a consequent atresia ani. The latter abnormities demand the formation of an artificial anus at the natural situation, or at some other suitable part, if they occur in individuals who are otherwise capable of sustaining life.

Defective formation may occur in the shape of tissue, of irregular communication of the intestinal tube, as in the case of the latter discharging at the navel, into the cavity of the urinary or small sexual organs (cloaca); it then is commonly the result of an arrest of development.

Excess of development, with the exception of the various degrees of biventral monstrosities, is probably nothing but a deceptive appearance; the repetition of some of its segments, and the presence of larger or smaller blind appendices, which open outwards or into the intestine, and more especially the so-called diverticula, are almost invariably to be considered as arrests of formation.

The latter, the congenital diverticula, Meckel's diverticulum verum, deserve a special consideration. It is a dilatation of the small intestine, representing a hollow appendix, which consists of all the intestinal membranes, and is placed at from eighteen to twenty-four inches from the cæcal valve; although we do not quite assent to Meckel's view, that it is a remnant of the umbilical canal, it evidently has its origin in the development of the intestine in the umbilical vesicle. We accordingly always find it solitary and attached at the above-mentioned spot; it varies in length from five to six inches; it sometimes is wider, sometimes narrower, than the intestine itself; it is frequently contracted at intervals, of a conical or cylindrical shape, and terminating in a round, clubbed, or lobulated expansion. It either projects at right angles from the convex surface of the intestine, hanging unattached in the abdomen, or it passes off at an acute angle from the concave surface of the intestine near the mesenteric insertion, being attached to the latter by a falciform process of the peritoneum. In this case it is often placed parallel to the intestine. Occasionally a ligamentous cord, the remains of the omphalo-meseraic vessels, is found at its free extremity, and as this may, by its adhesion to various points of the peritoneal cavity, give rise to internal hernia (strangulation of the intestine), it receives importance in a pathognomonic point of view.

The following case, in which this appendix was abortive, may be interesting: In the corpse of a young man, the small intestine was found enlarged at the above-mentioned spot, to the extent of several inches, the peritoneum and the adjoining laminæ of the mesentery were white and opaque, studded with tendinous patches, and a tolerably long ligamentous cord, the remains of the blood-vessels, was found depending from a rounded embossed dilatation.

We may finally observe that the entire intestinal canal or portions of it, are found in some individuals inordinately long or short; no fixed rule has, however, been established with regard to the relation among the parts themselves, to the stomach, the organs of mastication, &c.

§ 2. *Abnormities of Size.*—The congenital malformations belonging to this section, are the anomalies which we have described above, when speaking of the length of the intestine, and the true diverticulum.

The acquired malformations, as distinguished from the former, have reference to the caliber of the intestine, and are either dilatations or contractions.

The former occur either as uniform dilatations of the tube, or a lateral extension.

Uniform dilatation is the result of atony, or paralysis, consequent upon concussion, habitual repletion, peritonitis, rheumatism, typhus, dysentery, cholera, overstimulation by injections and purgatives, and the like; or it is the immediate consequence of disease in the nervous centres; or the dilatations may be developed as dilatations of an active character, i. e. with hypertrophy of the muscular coat above a constriction. In accordance with their etiological relations, they occur chiefly in the colon.

The lateral dilatation of the intestine occurs in a form resembling a diverticulum, constituting the false, in contradistinction to the true diverticulum; it is a hernia of the intestinal mucous membrane, resulting from the separation of the fibres of the muscular coat. It differs in every one of its characters from the true diverticulum:

1st. False diverticula consist solely of mucous membrane and peritoneum;

2d. They occur at the duodenum, in the entire course of the small and large intestines;

3d. They are found in considerable numbers;

4th. They occur from the size of a pea to that of a walnut, in the shape of round, baggy, pouches of the mucous membrane;

5th. They form, more especially in the colon, nipple-shaped appendages, which occasionally are grouped together in bunches; when occurring in the small intestine, they are commonly developed on its concave side, and are therefore placed between the layers of the peritoneum; when in the colon, the fæces are retained by them, and dry up into stony concretions.

Contraction of the caliber of the intestine at a small portion, or in a greater extent, is the effect of the pressure or traction exerted by large morbid growths, by hypertrophied contiguous organs, the impregnated uterus, uterine fibroid tumours, dropsy or cancerous degeneration of the ovary, &c.; it is brought on by incarceration or traction of the intestine in external and internal herniæ, by invagination, by adhesion of the intestine, accompanied by angular inflection at the point of adhesion; by compression of a large portion of intestine into a small space, in consequence of firm adhesions between the coats and the peritoneum; it is produced by disease of the tissues, and more especially by cancer (cancerous stricture), by cicatrization of tubercular ulcers, by the healing of loss of substance in dysentery, by catarrhal suppuration, by the scar following a gangrenous slough, or by simple hypertrophy. The passage of the intestine is moreover interfered with or entirely obstructed, by tumours which project into the intestinal cavity, and it is variously affected by foreign bodies.

We have lastly to remark, that we find various states of contraction and vacuity of the intestine coexistent with its blind termination, with an artificial anus, or with stricture.

In a different point of view we must here cite the anomalies which occur in the dimensions of the intestinal parietes: they appear in the shape of augmentation or diminution, i. e. thickening or thinning. Thickening is found to accompany or result from textural diseases, under which head this form will be considered; but it also presents itself as simple hypertrophy.

This either affects the mucous membrane and the muscular coat separately, or both simultaneously, together with the intervening cellular tissue. In the first and last cases it is the result of a repeated and habitual state of irritation of the intestinal mucous membrane, which, in accordance with a uniform law, after a certain duration gives rise to hypertrophy of the muscular coat, and an increase in the density and quantity of the intervening cellular layer. The hypertrophy of the mucous membrane is presented to us in a very characteristic shape in polypus of the intestine; this growth is peculiar to the colon, and chiefly to its terminal portion, being often remarkable for its length, its frequent repetition, and the massive cauliflower-like development of its free extremity. When hypertrophy exclusively or mainly affects the muscular coat, it generally results from excessive innervation accompanying habitual spasm of the intestine, or from extreme excitement of its muscular activity induced by repeated or continual repletion, as we see following a stricture.

Excessive thinning of the intestinal mucous membrane, presenting an appearance which resembles that of serous membranes, occurs chiefly in the colon after the protracted serous diarrhœas which accompany consumptive diseases; the tissues are there found in an anæmic and pallid condition, without exhibiting any conspicuous anomaly in consistency.

Atrophy of the muscular and mucous coats of the intestine is often seen in connexion with tabes universalis, though rarely as it appears, dependent upon idiopathic torpor of the abdominal ganglia; it is found coexistent with a wasting of the mesenteric glands in hypochondriac and melancholic affections, or as a signal of certain acute processes, as for instance, of typhus, or as a consequence of slow poisoning by lead. The thinning which, coupled with relaxation and friability of the intestinal membranes, occasionally exists simultaneously with an accumulation of fat in the mesenteries and omentum, is still more remarkable. The excessive production of fecal matter (copropoesis excedens) which frequently accompanies these two conditions, is important in reference to their pathogeny.

The follicular apparatus frequently becomes atrophied at an advanced age, but it may be similarly affected in consequence of acute diseases, such as ileo-typhus. Berres has demonstrated senile atrophy in the intestinal villi.

§ 3. *Deviations of Position.*—The intestinal canal may be irregular in position, either being placed altogether external to the abdominal cavity, or by its relations and its disposition within the cavity being irregular.

In the first class we reckon the following congenital irregularities: protrusion of the intestines, external to the abdomen, from absence of the parietes, or from fissure at or near the median line (eventration, omphalocele, congenital umbilical hernia); congenital inguinal hernia; thoracic hernia from partial or total absence of the diaphragm, the left side of the latter being chiefly liable to this malformation. To the acquired irregularities belong prolapsus of the intestines, resulting from penetrating wounds of the abdomen, wounds or rupture of the diaphragm, and the different forms of ordinary hernia.

In the second class we reckon, as a congenital deviation, the lateral transposition which is likely at the same time to involve secondarily, not only the other abdominal, but also the thoracic viscera; the various changes of position, produced by diffused or circumscribed fluid effusions or accumulations, by hypertrophied viscera, or by morbid growths; the spontaneous descent of the transverse colon into the hypogastric region, of the small intestine into the pelvic cavity; external and so-called internal hernia; invagination and prolapsus ani, the two being identical in character and causation; the changes of position which the intestine experiences in consequence of the cellular or fibro-cellular adhesions that it forms with the parietes, and that unite the coils to one another.

For external hernia we refer the reader to surgical works; we shall here examine only the relations of internal hernia, invagination, prolapsus ani, and the change of position produced in the intestines by adhesion.

1. *Internal hernia.*[1]—We define internal hernia, in contradistinction to external hernia, as a change of position in the intestine leading to incarceration, which occurs in the abdominal cavity without the formation of an hernial sac, and which is therefore not accessible to the usual mode of examination applicable to external hernia. Certain cases in which the intestine is placed or incarcerated in congenital folds or pouches of the peritoneum, such as we occasionally see in the hypogastric region, are to be viewed as transition forms between internal and external hernia (Vid. Peritoneum, p. 12). The former are also termed *incarceratio, strangulatio interna.*

They may be subdivided in the following manner:

a. Incarceration is the result of the simple pressure, which is exerted upon one or more points of the intestinal tube, by a portion of the intestine or by the mesentery, resting upon the former. It is a matter of course that this simple compression of a portion of the intestine, can only be effected in the direction of the resisting posterior walls of the abdomen, and at its lower segment; inasmuch as the occurrence of a similar relation anteriorly is inconceivable, on account of the smoothness and yielding nature of the parts. Experience confirms the fact that the small intestine, from repletion or increase of volume, is particularly prone to occupy abnormal positions; it is very liable to descend, and with its lengthy and frequently hypertrophied mesentery, fall and weigh upon the colon or the rectum, and to compress their walls.

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[1] Vide Oestr. Jahrb., x, 4.

These incarcerations of the intestine commonly occur at an advanced age, at which a descent of the intestines to a lower region of the abdomen and into the pelvic cavity, prolapsus of the pelvic viscera and large herniæ, which may be viewed as analogous conditions, are very frequent.

A long, flabby mesentery predisposes to the complaint; especially when, by traction, it has been converted into a pedicle or cord. Repletion of the intestine above a stricture, accompanied by atony, or the dislocation of the intestine in large herniæ (inguinal and scrotal herniæ), is likely to produce this effect.

b. Incarceration may be the consequence of a rotatory movement, and of this there are three varieties:

α. A portion of intestine may have become twisted upon its own axis, and we then find that even semi-rotation causes such an approximation of its parietes, that they touch and close up the passage. This can probably only occur in the colon, and according to the cases on record, only in the colon ascendens. Accumulations of gas, and unequal filling of different portions of the intestine, appear, as far as we are able to judge from the few cases which have been noticed, to be the cause. Such an occurrence is scarcely conceivable in the small intestine, on account of the uniformity of its caliber, the absence of angular flexures, and its loose position, as every rotation of one portion upon its axis would be counterbalanced by the rotation of the next segment.

β. The mesentery may be the axis, and the intestine will then be rolled up upon the former, i. e. the entire mesentery, or a portion of it, is twisted into a cone, and in proportion to the number of its rotations, more or less of the intestine will be dragged after it. In this case we must take into consideration the traction and the pressure, which the intestine suffers at the acute angle, which the dependent mesenteric cone forms with the base whence its point rises. This variety can scarcely occur anywhere but in the small intestine and its mesentery.

γ. One portion of the intestine, either single or double—a coil—may afford the axis round which another portion with its mesentery is thrown, so as to be throughout in contact with the circumference of the axis, and thus to compress it like a ferrule. This variety is evidently a higher degree of the first in which a portion of intestine is merely compressed from before backwards, and, as it were, flattened down. A coil of small intestine, the sigmoid flexure, or the cæcum, may form the axis.

The last two varieties occur like the first, chiefly at an advanced period of life. In early life a predisposition to the affection may be caused by a congenital malformation of the mesentery, by large herniæ, or by small herniæ when there is adhesion of the intestine.

This predisposition consists, first, as in the incarcerations of the first variety—in a congenital or acquired long, loose, and flabby mesentery, by which a rotation of the intestine round the mesentery or another portion of intestine is rendered possible; and secondly, in an enlargement of the abdominal, and especially of the pelvic, cavity.

c. The incarceration of the intestine may be effected by peculiar structures, which either belong to the normal condition, or are congenital malformations, or are, in part at least, the products of previous morbid processes. We allude to genuine incarcerations of the intestine in various annular spaces or fissures, of which we cite the following:

α. The fissure of Winslow, in which we once found a large portion of small intestine strangulated;

β. An intestinal diverticulum (verum), which is directly or indirectly, by means of an obsolete vascular cord, attached to a certain portion of the peritoneum;

γ. Adhesions of the free end of the cæcum, or of the vermiform process;

δ. Holes or fissures (congenital or acquired) in the mesentery;

ε. Malformations of the omentum, forming rounded or flattened cords and bands which are attached to the peritoneum, or furcated fissures of the omentum;

ζ. Pseudo-membranous formations, as the result of previous exudative processes, in the shape of cellular or ligamentous cords, bands, or plates, which pass from one part of the intestine or the mesentery to another, from the intestine to the abdominal parietes, the omentum or an organ of the abdominal and pelvic cavity, or from one of these to the abdominal parietes, or between the organs themselves.

It is most frequently a portion of the small intestine which is incarcerated in these structures; only the more moveable portions of the colon, the cæcum and the sigmoid flexure, are likely to become involved.

These varieties of incarceration are very common, and, as compared with the others, the most frequent.

They occur at every period of life. The female sex is more prone to them than the male, as the omentum, the diverticula that may be present, and pseudo-membranous formations, are not only frequently attached to the internal sexual organs of the female, but the latter are themselves liable to give rise to new growths.

The consequence of internal hernia is a distension of the intestine above the compressed or strangulated portion, peritoneal inflammation, paralysis, and ileus; the incarcerated portion in hernia of the third variety is from the strangulation of its mesenteric vessels peculiarly liable to congestion and gangrene.

This affection, when diagnosed, most imperatively requires an operative proceeding, for the purpose of disentangling and arranging the intestines, and for division of the strangulating structures with or without the knife.

2. *Invagination of the intestine.*—Invagination or intussusception,[1] incorrectly termed volvulus, consists in the inversion of a portion of intestine into the cavity of the adjoining upper or lower portion.

We frequently find intussusception in the corpses of children and adults, but in the majority of these cases it is produced during the last moments of life, during the death-struggle. It is the result of an unequal irritability of the intestine, and the consequent irregularity of its movements, and it is therefore frequent in diseases characterised by torpor of the cerebro-spinal system, and in the mortal agony proceeding from them; whereas it rarely or never occurs in diseases accompanied by, or ending with, abdominal paralysis such as cholera, typhus, general peritonitis, &c. In this case we find no traces of reaction, the parts are easily restored to their proper relations, the inversions are found occurring simultaneously at several points, though only in the small intestine, and the inversion may take place downwards, and at the same time, but rarely, upwards.

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[1] Oestr. Jahrb., xiv, 4.

Another form of invagination, which, once formed, presents itself as an idiopathic, dangerous, and often fatal disease of the intestinal tube, is of extreme importance, and will be the subject of the following remarks.

Every intussusception consists of three layers of intestine: of these, reckoning from without inwards, the first and second present their mucous, the second and third their peritoneal, surfaces to one another. The canal of the intussusception or volvulus passes through the latter. In order to facilitate comprehension, and in accordance with fact, we term the external layer of the intestine the sheath of the volvulus, or the intussuscipient portion, the innermost layer the entering tube, the middle one the receding or inverted tube, and the last two together, the intussuscepted portion, or the volvulus properly so called. It follows that isonomic layers are always opposed to one another; and we shall find this to be the case even when the intussusception is double, and consists of five super-imposed layers.

Between the entering and inverted tube we find a portion of mesentery, of corresponding size, and of an arcuate form. It is folded up so as to represent a cone, the apex of which lies at the free termination of the volvulus, with its base in the sheath, and at the entrance to the invagination.

This portion of mesentery is always in a state of tension, which chiefly affects the part belonging to the inverted tube, and has a singular influence upon the form of the volvulus. It is the cause of the following circumstances:

Firstly; that the volvulus does not lie parallel to its sheeth but always offers a greater curvature than the latter the inverted tube being compressed in its concavity into tense transverse folds.

Secondly; that the orifice of the volvulus does not lie in the axis or in the centre of the sheath, but external to it; and that, following the traction exerted upon it by the mesenteric fold that belongs to the inverted intestine, it is directed towards the mesenteric wall of the sheath; that it is not circular, but represents a fissure. This affords a diagnostic sign for the examination of intussusceptions of the rectum, which are within the reach of manual exploration.

Intussusceptions occur with equal frequency in the colon and small intestine; but several cases which have been described as occurring in the former are remarkable on account of the magnitude they attained. In these cases the sheath contains a very long portion of the colon and ileum; both may be inverted two or three times, and the intussuscepted part advances to the vicinity of the anus.

An inversion of the intestine from above downwards is the most usual occurrence. Post-mortem examinations have, with very rare exceptions, proved this to be the case; and it is but fair to assume the same in those cases in which, after urgent symptoms of danger, larger or smaller portions of intestine were discharged, and the patients recovered.

We naturally ask how the intussusception is brought about, and how its enlargement is effected?

The cause is to be found either in the contraction and moveability of a piece of the intestine, on which account it passes into the adjoining and more capacious tube; or in the extreme expansion or relaxation of a segment of intestine, which gives rise to an inversion of the adjoining narrower and more innervated portion. In every case the volvulus is formed at the expense of the external layer of the intestine or sheath. For we find that the entering portion, as it enters and advances (increase of the volvulus), is not reverted at its free termination to form the receding tube, but that the latter is formed by the inversion of the sheath at the entrance of the volvulus.[1]

Whether the intussusception takes place in one way or the other, the volvulus is not immediately subjected, as is commonly thought, to annular strangulation. In the first instance, the mesentery of the volvulus and its vessels suffer tension and compression at their entrance into the sheath; and, in consequence, we have in the volvulus an obstruction to the circulation, with swelling and intense redness, in short, violent inflammation, which gives rise to sero-sanguineous infiltration of the tissues, plastic effusion on the contiguous serous surfaces of the entering and receding tube, and upon the mucous membrane of the latter. The inverted portion is invariably the one that suffers most; the inflammation of the entering tube is less considerable, and it is characteristic, that even when the inflammation of the volvulus runs high, its mucous membrane remains pale; the sheath of the volvulus also is but slightly affected in small intussusceptions, with the exception of the peritonitis at the point where it enters. In large invaginations of the intestine, however, the sheath is more deeply involved in the inflammatory affection on account of the tension of the mesentery and the strangulation of the vessels.

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[1] [In other words, the volvulus increases at the expense of the inferior portion of the intestine.—Ed.]

In consequence of the tumefaction that results from the inflammation of the volvulus, we find, as a secondary occurrence, the formation of a true annular incarceration, either at the entrance, or in rare cases, at other points.

During this period, in which the volvulus becomes fixed, in consequence of the tumefaction, the incarceration, and even the adhesion of the contiguous serous surfaces, which is brought about by plastic exudation, it gradually or periodically enlarges to an enormous extent; the peristaltic action, and the increased accumulation of the intestinal contents, forcing the volvulus, the sheath of which continues to be progressively inverted, lower down. We are thus led to distinguish between a primary and a consecutive form.

If the intussusception does not prove fatal by the peritonitis which extends upwards from the serous surfaces of the entering and receding tube, with symptoms of strangulation, or by gangrene of the volvulus, it may have other more or less favorable terminations.

a. The most favorable issue, although purchased at the greatest risk of life, is gangrene and discharge of the volvulus and its mesenteric portion, subsequent to a complete adhesion between the entering and receding tube at the entrance into the sheath. At the spot where the separation has taken place, we find, in the corpses of individuals who had been thus affected, an annular swelling, which more or less interferes with the caliber of the intestine, and adhesions with the contiguous peritoneal surface, and more particularly of the mesentery.

b. In rare cases, in which the incarceration has been developed at an unusual point, only a partial sloughing of the volvulus takes place, and the portion which lies above the strangulation is retained. Under these circumstances, the latter forms a conical plug with a narrow channel, and projects into the cavity of its sheath, surrounded by a thick fringe of mucous membrane.

c. Occasionally the inflammatory action which has taken place in the volvulus abates, after having caused adhesion between the entering and receding tube, and the volvulus is retained.

The process described under *a,* generally leaves a sufficient passage, and consequently ends in a permanent cure, which cannot be predicated of the other two events. In the latter, a chronic state of hyperæmia and inflammatory intumescence remain, with a liability to exacerbations. General intestinal inflammation not unfrequently follows. The channel of the intestine does not suffice for the removal of its contents, and the volvulus, or the remainder of the volvulus, are moreover the cause of a consecutive increase of the intussusception.

Invaginations occur at all ages. Diarrhœa is the chief predisposing cause, and the most rational therapeutic proceeding consists, according as the inversion has taken place upwards or downwards, in an early injection or exhaustion of air by means of a syringe. To be effective, this must be done before the volvulus has formed adhesions.

Intussusception has an analogue in prolapsus ani.

3. *Prolapsus ani.*—Prolapsus ani is a volvulus without a sheath, and it is characterised by an inversion of the internal portion of the intestinal tubing. It represents a sausage-shaped or pyriform tumour, which is contracted at the anus, so as to form a pedicle, and at the free extremity there is, in trifling cases, a round central opening, which in larger prolapsus assumes an eccentric position, and, following the traction exerted upon it by the mesorectum, recedes so as to present a mere fissure. The external mucous layer is the seat of inflammation and swelling, which partly proceeds from

mechanical hyperæmia, partly from irritation produced by the atmosphere. It is the result of violent and lasting diarrhœa in children, or of blennorrhœa of the rectum in adults and old people.

4. *Altered position of the intestine consequent upon adhesions.*—These changes of position[1] vary according to the point of adhesion, and assume very different forms. They are of importance, as they sometimes offer impediments to the propulsion of the contents of the intestine; but this is not in a ratio with the extent or degree of adhesion, but bears a direct relation to the degree of dislocation produced in one or more coils of intestine. We are now alluding to the adhesions produced by cellular or fibro-cellular tissue, the remains of an entirely extinct exudative process, since we find that similar adhesions, when accompanied by heterologous formations, and especially by peritoneal tuberculosis, rarely produce constipation, but almost invariably give rise to diarrhœa.

We therefore speak of the following forms:

a. Partial circumscribed adhesions of the intestine, with the abdominal parietes, with a second, less moveable portion of the tube, with the mesentery, with the internal female sexual organs, &c., causing an angular inflection of the intestine. The inflection will be the more considerable, the more the adhesion is limited, and the more remote the latter is from the normal position of the intestine.

When occurring at the colon, the dislocation may be induced by direct adhesions of the less attached portions, or indirectly by the adhesions of the omentum, especially when the latter is shortened, or when it lies in the sac of an inguinal or femoral hernia.

b. Extensive adhesions among the coils or the mesenteries, that often affect the entire small intestine, in such a manner as to twist and bend them, and to produce external valvular duplicatures of the intestinal coats at the projecting angles. This form of adhesion is not unfrequently developed in intestinal segments which have long been included in large hernial sacs, in which case it is limited in extent. A remarkable instance of this was offered in a case of fatal constipation, where a portion of the ileum, twenty-four inches in length, was found inclosed in a cartilaginous sheath of peritoneum of four inches.

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[1] Oestr. Jahrb., xviii, 1.

§ 4. *Solutions of Continuity.*—These are the effect of penetrating injuries produced by cutting instruments or firearms, or they may be the result of concussions affecting the entire trunk, as in the case of a fall from a considerable height, or a small portion of the abdomen only, as from compression, in being driven over, &c., in either instance giving rise to rupture or laceration of the intestine; or they may be the consequence of ulcerative processes that proceed from without inwards, or *vice versâ*, in the shape of perforating intestinal ulcer.

The danger of these lesions bears a direct relation to their extent, and in the last case, also to the rapidity with which the morbid state is developed.

We must finally adduce those perforations of the intestine which are the combined result of mechanical injury, and of an ulcerative process brought on by foreign bodies that have been introduced into the canal; the putrefaction of the intestine, in consequence of sloughing gangrene at or near the spot; and the spontaneous and incurable ruptures of the intestine which follow its excessive distension above a stricture, and are commonly accompanied by circumscribed sloughing of the mucous membrane, or which are the consequence of complete softening of the coats.

Unless the injury affects the coats of the intestine in a very slanting direction, we find that in wounds produced by cutting or stabbing, sloughing or ulceration, the mucous membrane projects over the peritoneal surface in the shape of a tumid fold. In the case of ulcerative perforation, this will not take place until the destruction of the external and internal plates coincide.

In those cases in which a fatal termination is not induced by an escape of fecal matter into the abdominal cavity, giving rise to general peritonitis, nature adopts the following process:

After a mechanical injury has been inflicted, we find that in the vicinity of the orifice, plastic exudation immediately agglutinates the perforated coil to an adjoining surface, which temporarily closes up the hole; in ulcerative processes the perforation is generally anticipated by the inflammatory action of the peritoneum throwing out a guard of lymph.

This agglutination, when following injuries to the intestines that occupy the umbilical region, rarely unites them with the abdominal parietes, except by the intervention of the omentum, which protrudes into the opening of the abdominal walls; it commonly unites them to a neighbouring coil. The small intestine that lies in the inguinal region, the colon, a portion of intestine included in a hernial sac, are in close proximity to parietal regions allowing agglutination, and we there find the lymph converted into cellular tissue.

The opening in the intestine communicates with the external surface of the body by means of the agglutinating medium. After ulcerative or gangrenous perforation has occurred, the extravasated intestinal contents give rise to and maintain inflammation and ulceration; and thus perforation of the abdominal parietes or of the adjoining intestinal coil is induced. In the first two cases an abnormal opening of the intestine outwards is formed, which, according to its size, and in proportion as it suffices for the discharge of feculent matter, receives the name of fistula stercoralis or anus artificialis. In the latter case an abnormal communication is established between two portions of intestine (fistula bimucosa), and then we have a condition which presents a variety of complications.

These results may not take place; the minute intestinal orifice which results from ulcerative or gangrenous perforations, not sufficing to induce the secondary destruction of the adjoining abdominal or intestinal parietes, the agglutinating tissue is converted into a rounded extended cord, into which the perforated intestine sends a funnel-shaped prolongation of its mucous membrane, and the intestine itself is thus less firmly attached. Continued traction gradually closes up this funnel-shaped cavity, the cord becomes solid, and the mucous membrane cicatrizes over it, generally leaving a pouch at the spot. At a later period the cord may become detached, and it then shrivels up into a cellulo-fibrous nodule lying above the cicatrix of the mucous membrane.

The cure of fistula stercoralis is established in a similar manner. The intestinal opening communicates by means of a layer of organized lymph, with the external surface of the abdomen. The exudation gradually becomes distended so as to form a hollow cord, which, to a certain extent, is lined by the mucous membrane of the perforated intestine; continued traction lengthens out the cord, its channel diminishes at the same time and finally closes. The immediate consequence is the healing up of the external fistulous opening, and in the same manner cicatrization of the intestinal orifice may be effected.

§ 5. *Diseases of the Tissues.*—The muscular coat is scarcely ever proved (by cadaveric examination), to be primarily affected; the disease almost invariably arises in the mucous and the submucous cellular tissue, and involves the former secondarily; we are, therefore, the more limited to a consideration of the affections of the mucous and the submucous cellular tissues, as they demand a minute investigation on account of their extreme importance.

We may infer the general importance of this branch of pathology from the rank the mucous membrane occupies in the domestic economy, from the consequent frequency, and the variety in the forms of its idiopathic affections, but more especially from the frequency of the secondary complications to which it is subject, from the numerous relations which it bears to other systems and organs, and the fluids at large.

We introduce the subject of inflammation by a preliminary consideration of the hyperæmic and anæmic states of the mucous membrane.

1. *Hyperæmia, Anæmia.*—*a.* Hyperæmia is the result of active congestion, arising from idiopathic, sympathetic, or metastatic irritation, or it presents itself in the passive form as the precursor of asthenic inflammation, in consequence of a paralysed state of organic innervation; or it may be purely mechanical, arising from obstruction to the circulation by pressure, incarceration of the intestine and its mesentery, contraction of the large vessels and the heart, impermeability of the lungs, &c., in which case it affects the veins chiefly. In consequence of the vascular injection, the mucous membrane of the intestine offers various degrees of redness, or there are slight extravasations or ecchymoses; or, as is particularly seen in the last two cases of hyperæmia, the mucous membrane, or even the entire membranes of the intestine, may present an uniform reddish-black colour, the tissue being satu-

rated with blood, and no injection of blood-vessels being distinguishable; the larger vessels, and particularly the venous trunks are distended even as far as the mesenteries, and overcharged with blood (*apoplexia intestini*). In either case hemorrhage may take place into the cavity of the intestine.

b. Anæmia of the intestinal mucous membrane occurs in connexion with an atrophic state of the intestinal coats, and accompanying tabes universalis and general anæmia. It is often seen as a sequel of a rapid consumption of the vital fluids from excessive diarrhœa and exhausting discharges, and it appears in a very marked form in the gelatinous softening of the stomach and of the intestine in children. The intestine presents the colour of tissue that has been rendered pale by maceration; or it may have the peculiar yellowish pallor of wax.

2. *Inflammations of the intestinal mucous membrane.*—We are acquainted with a catarrhal (erythematous) and a croupy form of inflammation, and, on account of the prevalence of a dyscrasic type, we may consider the typhous and the dysenteric processes occurring in the intestinal mucous membrane as allied to the latter.

a. Catarrhal inflammation—or in a lower degree mere catarrhal irritation, catarrh—presents itself as genuine enterocatarrhus, with a discharge of a thin muco-serous secretion in catarrhal diarrhœas, namely, as a consequence of suppressed cutaneous exhalation. It may result from mechanical or chemical irritation of the intestinal mucous membrane by foreign bodies or stagnating fecal matter; it may also be developed in consequence of congestive or venous stasis in the portal system; or, lastly, it frequently shows a specific, contagious property (exanthematic, typhoid catarrhs), and appears as a precursor of these processes or associated with them, and in the vicinity of morbid growths.

Catarrh is either acute or chronic, and it either attacks the mucous membrane uniformly, or is developed mainly in the villi and follicles.

The anatomical signs of the acute form are, more or less intense redness and injection of the mucous membrane, affecting its entire surface, or appearing as punctiform reddening from affection of the villi, or as a vascular halo surrounding the follicles; relaxation of the tissue, and intumescence of the mucous membrane, equally affecting the entire substance, or only the villi and the follicles; opacity of the mucous membrane and its epithelium from infiltration of the former, and softening of the latter; friability and softening of the mucous membrane. The submucous cellular tissue is injected, relaxed, and infiltrated with a watery, opaque fluid; the secretion is at first copious and serous; as the affection increases in intensity, the former diminishes in amount, becomes opaque, viscid, and puriform.

Chronic inflammation is characterised, in addition to the above signs, by a dark, rusty, livid discoloration, which in severe cases appears to pervade the entire mucous membrane; by a tumid state of the mucous membrane and its follicles, accompanied by increased density of the tissue, copious secretion of an opaque, grayish-white, or yellow puriform mucus.

Acute inflammation frequently passes into resolution, but it often recurs, and may, if the predisposing cause is not got rid of, become habitual or chronic. Chronic inflammation rarely admits of a complete cure. It is generally followed by a blennorrhoic condition; and we thus find, in well-marked cases, a permanent dilatation of the vessels established, with the following alteration in the tissues:

A brown, slate-coloured, or bluish-black discoloration of the mucous membrane (deposit of pigment), involving its entire thickness, or the villi or the follicles only;

Increase of substance, or permanent tumefaction of the mucous membrane, its follicles, or villi, with increased density and consistence (hypertrophy), giving rise in higher degrees to elongation of the membrane, and formation of folds and polypi;

Hypertrophy of the submucous cellular tissue and the muscular coat;

Profuse secretion of a grayish-white and milky, or of a transparent gelatinous and viscid mucus (pituita vitrea).

Catarrhal inflammation occasionally passes into suppuration and ulceration. This is found to occur in consequence of frequent relapses of acute inflammation, but more particularly when an acute attack supervenes upon an existing chronic affection, or invades a blennorrhoic mucous membrane. The mucous membrane is converted into a dark-red, granulated and friable tissue, on the surface of and within which suppuration is established. This penetrates to the deeper tissues, and thus gives rise to abscesses, which open internally; in either case loss of substance is entailed, which increases with more or less rapidity; ulcers follow, which are surrounded by tumid, irregular, sinuous, undermined edges, having a granulating base, and extending into the surrounding cellular tissue or into the hypertrophied muscular coat. The suppuration may even pass through the latter by means of sinuses, in the vicinity of which the mucous membrane presents the above-described appearances, or is blennorrhoic, and often covered with polypous excrescences. This process is invariably accompanied by corrugation and slaty or bluish-black discoloration of the intestinal coats. Catarrhal phthisis thus occasions a contraction of the intestinal canal, which becomes more considerable after the cure of the former. Cicatrization is effected by a dense, resisting cellulo-fibrous tissue, which compresses the mucous membrane in the vicinity of the loss of substance, or the solitary insular remnants of the mucous membrane, into plicated polypous tumours.

The seat and extent of the catarrhal inflammation and of the blennorrhœa, differ according to the cause. They are frequently spread more or less uniformly over the entire intestinal tract; they are often limited to a certain portion of the colon or the small intestine, where they occupy large spaces; or they may occur in one or several small circumscribed spots, in consequence of local irritation. These affections are peculiarly liable to recur as long as the predisposing cause continues; they exacerbate from time to time if chronic, and lead to suppuration. They are not common in the small intestine, their usual seat being certain portions of the large intestine, viz. the cæcum and rectum.

A peculiar disease that must here advert to is ulcerative inflammation of the follicles of the colon, such as we find in lientery, brought on by tedious diarrhœas. An ulcer results, which is distinguished from the catarrhal ulcer just described, by the shape which it derives from the follicle, and still more by the total absence of reaction, which is brought on by the excessive destruction of tissue, and which produces an atonic and relaxed state of the tissues at the base.

In this disease, which in the dead subject is commonly not observed until it has committed extensive ravages, the follicles are at first tumefied in various degrees, and consequently project as smaller or larger round, conical nodules on the internal surface of the intestine, being surrounded by a dark-red vascular halo. Ulceration now ensues in the interior of the follicle, the small abscess penetrates the mucous membrane within the vascular halo, and a fringed ulcerated opening, of the size of a millet seed appears, which leads to a small follicular abscess with red spongy walls. The ulceration continues, and the follicle is eaten away. The mucous membrane that loosely surrounds the enlarged orifice of the abscess, overlays the exposed submucous tissue. In most cases the hyperæmia of this edge diminishes in consequence of the exhaustion brought on by the discharges; it becomes pale, or is discoloured by a deposition of black pigment in its tissue, which gives rise to a slaty appearance. The ulcer is of the size of a pea or a lentil, round or oval, the mucous membrane at the circumference is pale, slate-coloured, livid, and much relaxed, the cellular tissue at the base is dull white, anæmic, sanguineous or dark blue. A flabby typhous ulcer of the colon is the only thing that might render the diagnosis uncertain.

At this period a secondary destruction of the intestinal mucous membrane commences, which proceeds with great rapidity. The original follicular ulcer enlarges in every direction, forming sinuses and exposing the pale, lax, muscular coat at its base. Several ulcers coalesce, and we thus frequently find the mucous membrane and its cellular substratum destroyed to a considerable extent, and the remaining portion of the mucous membrane pale or slate coloured; there is general anæmia and tabes; and the contents of the intestinal canal consist of the half-digested food mixed up with reddish, semifluid, grumous matters.

We may state it as a rule, that the lower down the original, as well as the secondary process take place, the more fully they are developed. Hence the most extensive destruction is found to occur in the sigmoid flexure and the rectum. It is always confined to the colon. Occasionally the disease runs a still more rapid course, as in infants at the breast; and it is then accompanied by catarrhal irritation of the small intestine.

On account of the alvine discharges, which are invariably associated with this ulcer, the affection may not inappropriately be termed ulcerative diarrhœa.

b. Exudative processes of the intestinal mucous membrane.—Under this head we include all those products of serous, albuminous, pasty, fibrinous, puriform, and purulent exudation occurring on the mucous membrane, which are more or less profuse, and are preceded by slight redness and congestion. Maceration and solution of the epithelium, relaxation and infiltration of the mucous and submucous tissues, fusion (as it were self-secretion) and gradual disappearance of the mucous membrane and its follicles, take place at the same time. The mucous membrane is softened and tumid, it is infiltrated with the exuded matter, variously reddened and injected, or pale, or of a dirty gray or tawny colour. In proportion to the degree of vascularity and the quality of the exudation, it is more or less pultaceous, and attenuated or entirely destroyed.

We here also adduce the process that takes place on the intestinal mucous membrane in cholera, the acute pituitous condition of the mucous membrane (Eisenmann's pyrotic process), genuine croup, puriform and purulent diarrhœas, &c.

These processes probably always involve a large tract of intestine, and are the expression of a constitutional affection, which itself may either be primary or secondary; in the latter case it represents a degeneration or an anomalous form of the original disease. The not unfrequent degenerations of specific cachexiæ, such as typhus, the exanthemata (particularly variola and scarlatina), acute tubercle and cancer, which were originally acute, or have become so under certain conditions, may thus present the type of the process just described.

c. The Typhous Process.—The first duty of the pathological anatomist in this case, is to institute a comprehensive investigation of the local typhous processes, and we offer the results derived from the observation of normal ileo-typhus as it is presented in the indigenous form, which is commonly very defined in its localization. On account of the importance of the subject, we shall add a summary of the changes that occur in other systems and organs in typhus, as well as a synopsis of the more important anomalies of the typhous process, that we are at present acquainted with.

The Typhous Process in the Mucous Membrane of the Small Intestine.

The typhous process of the small intestine presents four stages:

The congestive stage.

The stage of deposition of the typhous product,—of typhous infiltration; the crude stage of the deposit.

The stage of softening and rejection of the typhous deposit.

The stage of the genuine typhous ulcer.

In the first stage, which corresponds to the period of irritation, with a predominance of catarrhal and gastric symptoms, we observe on the mucous membrane of the small intestine, dilatation and stasis in the venous system, with swelling, and a peculiar succulence of the mucous membrane, accompanied by opacity and slaty discoloration. The swelling of the villous layer is particularly distinct. This condition affects, more or less, the entire mucous membrane of the small intestine, but it developes itself more strongly at some parts than at others, and there generally appears to be a gradual increase from above downwards, as far as the cæcal valve. The inner surface of the intestine is invested by a thick layer of dirty, yellow, gelatinous mucus.

The mesenteric glands are slightly swollen, their blood-vessels are injected, the tissue itself is elastic, soft and dark-coloured.

In the second stage the congestion is diminished; the injection and reddening, and even the swelling of the mucous membrane, retract within circumscribed spaces which correspond with Peyer's agminated glands, or occasionally with solitary follicles. Rounded or more commonly elliptical tumefactions (plaques), varying in thickness from half a line to three lines, are formed, which result from the deposition of a peculiar substance in the tissue of the Peyerian plexus and of the submucous cellular tissue. They are surrounded by a vascular wreath which stops short at their circumference, and by a marginal plane which rises abruptly, or is contracted, so as to appear pediculated. In the latter case they the more resemble flat sessile fungi, as they often present an umbilical indentation at their centre. According to the amount of matter accumulated, the mucous membrane is more or less tense, being intimately blended with the deposit, as this again is firmly and immoveably attached to the muscular coat of the intestines.

The typhous patches offer a gray, or tawny discoloration, which is perceptible through the mucous membrane as well as through the two external coats of the intestine, and they are hard and resilient: when the discoloration is darker, and more of a bluish-red tint, they are softer and more compressible. They appear, when seen through the peritoneum, as insulated spots; they may be generally recognised by the varicose condition of the peritoneal vessels, and they are perceptible to the touch through the tumefaction on the external surface of the intestine.

The lower third of the small intestine is the common seat of typhous infiltration, and the typhous spots are placed at the side opposite to the insertion of the mesentery; they increase in number towards the cæcal valve. They vary in size from that of a sixpence to half-a-crown; towards the terminal portion of the small intestine, in correspondence with the extensive glandular apparatus that exists here, they occupy a space of several inches, and end upon the ileal surface of the valve. Near and between the patches we find single, round, nodulated tumours of the size of a hempseed or pea, surrounded by a similar vascular wreath; these represent the typhous infiltration of a solitary follicle.

On minute examination of the morbid product, it proves to be deposited under the mucous membrane and in the submucous tissue, without involving the muscular coat. It presents a substance of more or less density, of a pale-red colour and fibro-lardaceous texture; it is occasionally traversed by streaks of blood. The deposit very rarely extends beyond the follicular apparatus.

The swelling of the mesenteric glands also increases; they are of the size of a bean or hazlenut, blue or bluish-red, tolerably firm, and apparently infiltrated with a lardaceous mass.

The commencement of the third stage is marked by a return of violent congestion to the small intestine. The vessels, and especially the veins of the mesentery and their ramifications between the intestinal coats, are filled with dark-purple and viscid blood. The mucous membrane again swells, the villi in particular tumefy, and on pressure, exude a grayish-white, opaque serum.

The most remarkable change is now effected in the typhous patches and in the mesenteric glands; they soften. The patches become more tumefied, and if the softening process does not affect them uniformly, they acquire an uneven tuberculated surface. The deposit is converted into a grayish-red, medullary mass; this may, from the imbibition of bile, be at once metamorphosed into a dirty-yellow or brown slough, involving the investing mucous membrane. The slough shrivels up in a vertical and lateral direction, becoming loose at the edges and pultaceous, splitting in various directions. and detaching itself from the lowest stratum of submucous cellular tissue, by which means it is wholly or in part discharged; or the morbid product degenerates, when the epidemy is of very intense character, into a loose, vascular, fungous growth, which is traversed by streaks of extravasated blood, or is entirely saturated with blood; it is the chief source of profuse intestinal hemorrhages, and is generally discharged piecemeal without antecedent sloughing.

This metamorphosis sometimes attacks the entire patch, sometimes it only affects single portions or separate folliculi; in the latter case the remainder of the patch passes through a retrograde metamorphosis; absorption causes it to collapse, and a lax, succulent, plicated tumefaction of the glandular plexus remains. Accordingly, the above-mentioned slough is in the former instance embraced by the mucous membrane, which invests the marginal surface of the typhous patch; in the latter, by the retrograde[1] portion (retrograder antheil) of the glandular plexus.

A similar metamorphosis takes place in the tumefaction of the solitary glands, though it appears to commence later, and to advance less rapidly; the sloughs are small and rounded, and seem generally to undergo the retrograde process.

This metamorphosis commences in the neighbourhood of the cæcal valve, and is commonly in advance of that which takes place at the upper part of the ileum.

The intestine is more or less distended with gas (meteorismus); it also contains yellow or brownish, muco-gelatinous or biliary matters, mixed up with grumous, furred particles; it always occupies a low position in the hypogastrium, and even sinks into the pelvic cavity. The cæcum is very often found to contain the trichocephalus dispar in larger or smaller numbers.

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[1] [The terms "retrograde" and "retrogression" are intended to designate the return of a diseased part to its normal condition by absorption of the deposit, or otherwise. They have been adopted from the absence of any terms which exactly convey the author's meaning.—Ed.]

The mesenteric glands, which almost invariably pass through the stages of the metamorphosis with less rapidity than the typhous products in the intestine, now attain their largest bulk; they reach the size of pigeons' eggs, and, in the vicinity of the cæcal valve, even of hens' eggs, and form a tuberculated chain which extends in a slanting direction from the terminal portion of the ileum to the lumbar plexus. Their colour is blue or bluish-red; they are much congested, and the vessels, spread out in the cellular capsule of the gland, present a vascular network which is perceptible through the mesenteric laminæ. Their substance is firm, but they are soon converted into a grayish-red, lax, medullary matter, in which we frequently discover extensive extravasations of blood; they then become soft and elastic, or even present distinct fluctuation.

Fourth stage. After the morbid product has been detached, a cavity remains on the internal surface of the intestine, which represents the true typhous ulcer.

If the entire morbid growth is removed at once, that portion of the intestinal mucous membrane which invested the marginal surface of the heterologous product sinks down upon the ulcer, and thus forms a mucous fringe, which varies in width and extent according to the previous elevation (thickness) of the morbid growth; and from being at first dark-red, subsequently assumes a blackish-blue or slate-gray colour. If the morbid growth has only been partially detached, the remaining portion of the patch becoming retrograde, we find the smaller ulcerated surface equally surrounded by a margin of glandular tissue.

In the former case the base of the ulcer corresponds in form and size to the previous infiltration (plaque); varying in size, it is either round or, more frequently, elliptic; the latter shape prevails at the terminal portion of the ileum, and the long diameter of the ulcer corresponds with the longitudinal axis of the intestine. In the second case the ulcer is, at all events, smaller than the entire Peyerian gland, its shape irregular, the margin sinuous or round. Several ulcers are often grouped together. For the typhous infiltration of a solitary follicle a circular or slightly oval ulcer is substituted.

The deep submucous cellular layer, which invests the muscular coat, forms the base of the ulcer.

The mesenteric glands decrease in size, as soon as the detachment of the intestinal morbid growth has commenced, in proportion as the grayish-red medullary substance, with which they are infiltrated, is removed, though they still continue larger than they are in the healthy condition; in consequence of the enduring congestion and enlargement of the vessels they present a reddish-blue tinge.

The typhous ulcer consequently presents the following characters:

Firstly. Its form is elliptical when it corresponds to the infiltration and detachment of a larger patch of Peyer's glands; it is round when it corresponds to a solitary follicle or a rounded patch, or to the partial detachment of a glandular plexus; and, lastly, it may also be irregular or sinuous when corresponding to a partial detachment.

Secondly. The size or circumference of the ulcer varies, from that of a hemp-seed or pea to that of half-a-crown.

Thirdly. The position is peculiar in reference to those of an elliptical shape; they are placed opposite to the insertion of the mesentery, and their long diameter is always parallel to the longitudinal axis of the intestine; the typhous ulcer never forms a zone; at least, we have only once seen this occur in many hundred cases.

Fourthly. The margin of the ulcer is invariably formed by a well-defined fringe of mucous membrane, which is a line or more wide, detached, freely moveable, of a bluish-red, and subsequently of a slaty or blackish-blue colour.

Fifthly. The base of the ulcer is formed by a delicate layer of submucous tissue which covers the muscular coat; like the marginal substance, it is quite void of morbid growth.

Sixthly. The small intestine is the seat of the ulcerative process, and the lower third is most liable to be involved—the number and size of the ulcers increase as they advance towards the cæcal valve.

The cure of the typhous ulcer to be complete, requires several local and general conditions, of which the chief are the termination of the local process, and the complete extinction of the typhous dyscrasia. When such favorable circumstances occur, the cure is effected in the following manner:

The fringe of mucous membrane which lies upon the base of the ulcer, gradually connects itself, from without inwards, with the cellular tissue that invests the base, and uniting with it becomes paler and thinner. At the same time the cellular layer becomes whiter and denser, and is finally converted into a serous lamina, the circumference of which is dovetailed between the muscular and mucous coats. The margin of mucous membrane is bevelled off in such a manner, that the union is imperceptible; the former does not advance uniformly on all sides towards the centre of the ulcer, hence the elliptical is converted into a sinuous, the round into an elliptical ulcer. At the same time the margin, as well as the neighbouring mucous membrane, are thinned down in such a manner, that at last their villi appear to have been transferred to the serous lamina. The edges unite finally at one or more spots, and coalesce. We have sometimes observed, that long before the union of the edges, small villosities formed independently on the serous lamina, a fact which has been also remarked by Sebastian.

Instead of the ulcer we find, in proportion as the above process is effected, a slight depression on the internal surface of the intestine, dependent upon the thinning of the mucous membrane and its connexion with a thin cellular layer of denser structure,—or we find a spot at which the mucous membrane is more firmly attached and less moveable, in the middle of which, by oblique light, we may often discover a smooth remainder of the serous lamina of the size of a millet seed; or, if even this is not the case, we discover a spot at which the mucous membrane is more tense, void of plicæ, smooth, less vascular than the surrounding portion, and particularly less villous.

Such cicatrices have occasionally been observed thirty years after the typhus had occurred.

It is singular, and characteristic of the typhus ulcer and its cicatrix, that it never in any way gives rise to a diminution of the caliber of the intestine.

The mesenteric glands in the meantime have returned to their normal size; they not unfrequently shrivel up, so as to become considerably smaller, and at the same time tough and pale.

Summary of the Alterations occurring in other Organs.

a. In the abdominal cavity.—We find that here only the spleen and the venous system of the fundus ventriculi offer important and constant changes, although these do not belong exclusively to typhus, and still less to ileo-typhus.

The spleen is enlarged to from twice to six times its natural size, it swells, and its sheath becomes tense and smooth; the tissue of the organ is friable, and contains a dark purple or blackish-red, semi-coagulated, pultaceous, or perfectly fluid mass, which gives rise to a tumour of peculiar appearance, occasionally communicating the sense of fluctuation; not unfrequently a spontaneous rupture of the organ ensues.

At the fundus ventriculi we find venous congestion, which may be traced back to the vessels of the spleen, and which is either limited to the larger trunks or affects the capillary vessels in the tissue of the mucous membrane; in the latter case, the mucous membrane of the fundus is dark red, lax, and turgid, and, in consequence, similar to the condition of the spleen, rather more friable than in the normal state. Allied to this condition is the first stage of softening, which, however, does not appear in the ordinary course of typhus.

b. In the thorax.—The bronchial mucous membrane and the parenchyma of the lungs present certain constant changes, which, however, vary in degree.

The former is affected by a peculiar catarrh, accompanied by dark-red discoloration, and the secretion of a viscid gelatinous mucus, which increases in amount as we descend to the smaller subdivisions of the bronchi; the pulmonary parenchyma presents symptoms of hypostatic congestion, which is generally limited to the posterior and lower portions; the tissue appears dark red, or purple, is filled with dark-coloured glutinous blood, is denser, and resembles the spleen in consistency (splenification); this is sometimes increased to hepatization (pneumonia), though it is to be carefully distinguished from secondary, and still more, from primary pneumonic typhus.

The heart is commonly flaccid, its muscular portions are pale, or of a dirty-red colour, but without any further anomaly, and more especially without that softening of its substance described by Stokes as occurring in the typhus fevers of Ireland.

The endocardium and the lining membrane, or all the coats of the vascular trunks, frequently present a brown or purplish discoloration produced by imbibition.

c. *Alterations in the nervous system.*—The brain and the spinal cord and their membranes present the most various gradations with reference to the amount of blood they contain, from hyperæmia to anæmia; they sometimes are characterised by remarkable density and tenacity, sometimes by a humid and softened condition.

The double condition which is frequently and distinctly seen in the central ganglia of the vegetative system, is of still greater importance, and the results obtained at the Viennese Hospital, since the year 1824, with regard to this question, are in the main corroborated by the observations made at the Wurzburg school of medicine.

The ganglia of the solar and superior mesenteric plexus are, in the first stages of typhus, in a state of turgescence, with a blue or greenish-red discoloration; they are softened in the ulcerative stages, and subsequently we find them collapsed, pale, flaccid, shrivelled up as it were into coriaceous, tough, white or grayish masses.

We have never discovered in the nervous system the characters of genuine inflammation, a fact which is also established by the investigations of Rey, in opposition to those of Grossheim.

Summary of the most remarkable Anomalies of the Local Typhous Process.

An acquaintance with the many anomalies of this process is of such importance, that we would not trust a person ignorant of them to judge of a post-mortem examination in a case of acute fever. Their diagnosis is the result of researches which we have for many years devoted to the subject. We add a list of the anomalies, and subjoin the most essential explanations at once:

1. Anomalies in reference to the *amount* of the process occurring on the intestinal mucous membrane.

a. Arrest of its development.

α. Arrest in the congestive stage—diffused typhous process in the intestinal mucous membrane.

β. Imperfect development of the patches—low plasticity of the morbid product. This variety is allied to the diffused form.

γ. Retrogression (retrogradwerden) of the morbid growths by absorption;—to this head belong Chomel's *plaques à surface reticulée*.

δ. Slow metamorphosis of the morbid growth, tardy separation of the slough, and purification of the ulcer.

ε. Scanty formation of the morbid growth.

b. Excessive development of the local process.

a. Tumultuous[1] (tumultuarisch) metamorphosis of the morbid growth, violent congestion of the intestine, unusual turgescence of the morbid growths. The congestion not unfrequently gives rise to peritonitis, which proceeds from one of the patches; or an extravasation of blood occurs between the intestinal coats, and in their tissue; intestinal apoplexy, or a fungoid degeneration of the morbid growths takes place, and death ensues from excessive vegetation, by paralysis, or from exhaustion by hemorrhage (hæmorrhagia intestinalis).

β. Numerous formations of morbid growths—extension of the same to the solitary follicles.

γ. Extension of the process beyond the ileum to the jejunum and stomach, or to the colon.

2. Anomalies in *quality*.

a. Impeded cicatrization of the ulcer—it assumes the torpid form.

b. Degeneration into a perforating typhous ulcer.

These two forms constitute genuine typhous intestinal phthisis. We have seen that the local condition for the cure of the typhous ulcer consists in a complete termination of the local morbid process in the intestinal mucous membrane, and a perfect purification of the ulcer of all morbid growth, and that, as a general condition, an extirpation of the typhous and of every secondary dyscrasia is required; it is therefore evident that the degenerations of the typhous ulcer which we are now considering may be complicated with a variety of anomalies; of these some have already been considered.

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[1] [The German word "tumultuarisch" implies, violent symptoms taking place with suddenness and rapidity; Rokitansky has himself used the term in a new sense; the translator, to avoid frequent circumlocution, has therefore ventured to employ the word "tumultuous" as most adapted to convey the author's exact meaning.—Ed.]

Perforation of the intestine by the typhous ulcer constitutes a very remarkable phenomenon. How is this effected? The typhous process invariably meets with an isolating tissue in the lower stratum of the submucous cellular layer and of the muscular coat; the destructive process which occurs beyond the mucous membrane, is therefore not the result of a previous typhous affection (infiltration) but of an essentially distinct process. It is this that affords a marked distinction between the perforating typhous and the perforating tubercular ulcer. The process by which perforation of the intestinal parietes at the base of the ulcer is effected, is softening or mortification of the tissue; the slough that results only affects the deepest parts of the ulcer to a small extent, and we rarely find the orifice larger than a pinhole, or a millet or hemp seed.

The varying period at which in the course of typhus the ulcer degenerates in this manner, is remarkable, as also the rapidity with which occasionally the perforation is effected. We have observed it occur rapidly in ulcers that had scarcely formed, whilst the remaining morbid growths were engaged in the metamorphosis, or even in the crude stage; and again we have seen it occur slowly or quickly at every subsequent stage; long after the termination of the local process, and even after the genuine typhous had subsided into the atonic ulcer.

The consequence of the intestinal perforation, and of the resulting effusion of the intestinal contents into the peritoneal cavity is peritonitis; it generally gives rise to tolerably copious, but uncoagulable and liquid exudation; it frequently takes place even before actual perforation has ensued, and is developed as soon as the process of perforation approaches the peritoneum.

The exudation commonly induces an adhesion between the perforated coil and another coil, or between its mesentery and the pelvic parietes; which may certainly be looked upon as an effort of the *vis medicatrix naturæ*, but which our investigations have proved, never to effect a radical cure of the typhous perforation of the intestine.

Our experience with regard to the perforating process, does not, except in rare cases, allow us to concur in the view adopted by several French observers of distinction, that it is to be considered as a rupture of the ulcerated part; nor can we sanction the doctrine of Judas, that the intestine, when on the point of being perforated, moves into the pelvic cavity, in order to find suitable spots for adhesion, inasmuch as the typhous intestine sinks into the lowest region of the abdominal cavity long before the ulcerative degeneration takes place.

Appendix.—Anomalies in reference to the Degree and Character of the Typhous Process in the Mesenteric Glands.

1. Tumultuous metamorphosis of the typhous product in the mesenteric glands.

This sometimes consists in very violent congestion of the gland, which not unfrequently gives rise to inflammatory injection of the mesenteric laminæ above the gland; or great tumefaction takes place, and the gland is converted into a medullary, ichorous pulp; or, lastly, a fungous growth forms, which perforates one of the mesenteric laminæ, commonly the anterior one. General peritonitis is a frequent consequence of these occurrences; in the last instance we have, as in the case of intestinal hemorrhages, extravasations into the peritoneal sac. This anomaly generally occurs in a gland that is seated near the termination of the ileum, and is accompanied by a tumultuous metamorphosis in the intestinal mucous membrane.

2. Atrophy of the mesenteric glands.

The involution of the mesenteric glands after the termination of the typhous process, is sometimes carried to excess, and an atrophy of these glands results. They then appear shrivelled, flaccid, coriaceous, perfectly bloodless, pale or gray, or even of a dark blue colour. Occasionally the atrophy is less perceptible, as the gland appears of its normal, or even beyond its normal size; this, however, is only the consequence of passive congestion or stasis, from dilatation of the vessels, which are full of blood, and give it a bluish-red colour, the glandular tissue itself being diminished.

The typhous ulcer of the intestine at the same time assumes a torpid condition, or it may have advanced, in some measure, to cicatrization.

We shall show at a future period how this condition forms an important anatomical basis for the constitutional debility consequent upon typhus.

3. Secondary typhous processes.

An acquaintance with these processes is the more important, as they throw much light upon the nature of typhus, as they have hitherto been but little known, and as their connexion with the primary disease is commonly overlooked. They almost invariably present anomalies in reference to the seat of the typhous process; several of them are remarkable for the frequency of their occurrence. They are to be distinguished either as genuine or as degenerated typhous processes.

Genuine secondary typhous processes generally depend upon marked anomalies in the degree of the primary process. The most exquisite form in which they present themselves is seen in the mucous membranes, which we must consider as the true nidus of the typhus.

a. Secondary processes in mucous membranes.

α. Recurrent eruption of the mucous membrane of the small intestine.—We may find typhous patches of recent formation in the crude stage, intervening among typhous formations which are undergoing the metamorphosis or at the side of the typhous ulcer. These must be carefully distinguished from the patches which are less advanced in their development. This eruption is occasionally seen in a very undeveloped state, in the form of a miliary swelling of the solitary follicles.

β. Secondary typhous process in the mucous membrane of the colon and stomach;—secondary colo-typhus, secondary gastric typhus.—The latter is a rare occurrence; it stops short at the congestive stage when it does take place, and very rarely presents the nodulated form of the typhous deposit.

γ. Secondary laryngeal typhus.—This is a secondary typhous process of considerable importance, both on account of its frequency and on account of its unfavorable prognosis. Its seat is the posterior surface of the larynx and the edges of the epiglottis; it not unfrequently gives rise to typhous laryngeal phthisis, accompanied by necrosis of the cartilages.

δ. Secondary pharyngeal typhus occurs much more rarely than the former, and never except in company with it.

ε. Secondary bronchial and pneumonic typhus.

This must be carefully distinguished from the hypostatic pneumonia frequently developed in the course of typhus, as well as from capillary phlebitis of the lungs.

ζ. Secondary typhous process in the vesical mucous membrane.

η. Secondary typhous process in the mucous membrane of the female sexual organs.

b. Secondary typhous processes in serous membranes.—Among these we reckon the typhous inflammations of the pleura, of the meninges, of the capsule of the aqueous humour, and of the internal coat of the vessels (Phlebitis typhosa).

c. Secondary typhous processes in parenchymatous organs.—These are the typhous inflammations of the liver, the spleen, the parotid, and the ganglionic substance of the brain and spinal cord.

The degenerated secondary typhous process occurs in various forms; in almost all of them a suspicion arises of the existence of a disease analogous to typhus, and this fact offers the more interest, as we have arrived at similar results in our special investigations of the morbid anatomy of ileo-typhus. Autenrieth describes them as neuroparalytic inflammations, Schönlein as neurophlogoses, Eisenmann as pyra, Buzorini under the head of typhus. They are based upon a corresponding degeneration of the typhous process in the blood, and may be classed as follows:

α. Degeneration into croupy inflammation.—This includes the entire exudative processes of the mucous membrane, of the respiratory organs, the œsophagus, the stomach, the intestinal canal, the female sexual organs; as well as all the secondary exudative processes occurring on serous membranes; and the exudations that ensue on the cellular and muscular base of the typhous ulcer, as a degeneration of the local affection of the intestinal mucous membrane.

β. Degeneration into acute softening.—To this class belong first of all the remarkable and frequent cases of black ramollissement of the fundus ventriculi and the œsophagus in which the spleen sometimes participates, and which originates in the vascular system; and in a second degree the softening of the pulmonary parenchyma, and of the mucous membrane of the bladder. When occurring as a degeneration of the local process, it is found at the base of the typhous ulcer, and may superinduce perforation of the intestine. (Vid. p. 76.)

γ. Degeneration into gangrenous inflammation and primary gangrene.—This includes the well-known phenomena occurring in the course of typhus in the shape of noma, gangræna pulmonum, sloughing of the nates (decubitus), of parts to which vesicants have been applied, and of the female sexual organs. It may occur as a degeneration of the local process, and by sloughing at the base of the typhous ulcer induce perforation of the intestine.

d. Degeneration into a process in which pus, or rather a fluid analogous to pus is formed.—This involves suppuration of the patches and of the typhous ulcer, in the mesenteric glands; as well as suppuration in the lungs, the spleen, the liver, the parotid, in the subcutaneous cellular tissue, between the muscles, &c.

Besides these anomalies, there are other sequelæ of typhus, which are based upon a permanent depression of the entire vegetative system, such as tabes universalis; or upon a diminution of nervous power, as obtuseness of the senses or paralyses; or again upon continued irritation, as hydrocephalus; or lastly, upon a secondary constitutional disease, as presented in œdema, anasarca, permanent suppurative processes, and Bright's renal disease.

The depression of the vegetative system remaining after typhus demands special investigation. It is presented either as a very slow progress of convalescence, or in the advanced degree as genuine tabes; both forms are distinguished by their peculiar type. The following are the anatomical points which characterise them:

α, Genuine intestinal phthisis, or where a cure of the intestinal ulcers has begun, or is almost terminated, a loss of villi and follicles;

β, A shrivelled condition or marasmus of a considerable number of mesenteric glands; and

γ, The flaccid atrophic condition of the abdominal ganglia, and more especially of the solar and superior mesenteric plexus, which, as well as the former, we have already adverted to.

EPICRISIS.

Firstly. Typhus is characterised anatomically and in reference to the alterations in the solids, by the deposition of a peculiar product, which undergoes a peculiar metamorphosis.

Secondly. Its habitat varies and depends upon the specific relation existing between the general disease and certain organs.

Indigenous as well as exotic typhus show the mucous membranes and the lymphatic glands to be the chief seat; in Austria it is chiefly the mucous membrane of the small intestine, yet even here bronchial and pneumonic typhus occur as a primary affection, and ought probably to be considered as the basis of the exanthematic form; we also, though very rarely, meet with colo-typhus.

Thirdly. The product of typhus presents in its first, but still more, in its later stages of metamorphosis, the greatest analogy with cancerous growths, and more particularly with medullary cancer.[1]

Fourthly. The local typhous process is a species of inflammation; but not one of those to which we attribute a phlogistic crasis of the blood, but one which, on account of the peculiar diseased condition of the blood, we term typhous.

Fifthly. The local affection of the mucous membrane of the small intestine, is a constant accompaniment of the typhus seen among ourselves; but as, according to our previous observations, it may occasionally be subject to an arrest of development, we find solitary exceptions in which there is no intestinal affection; in that case it is necessary to watch the other mucous membranes closely, or, indeed, the process, without being localized, may run its entire course in the blood.

It is well known that typhus occurs chiefly during the period of puberty and during the prime of life; before and after this epoch, it is very unfrequent; we must however guard against considering every typhoid appearance in Peyer's patches, during the early years of life, as genuine typhus. The predisposition seems to disappear with the involution of the sexual powers; still it does occur now and then, after the sixtieth and seventieth years of life.

Typhus presents a peculiarly interesting negative relation in reference to its capability of forming combinations. Pregnancy offers an almost entire immunity from typhus, lactation less so, and cases in which it is complicated with tubercular affections, with cyanosis, cancer and the cancerous cachexies are exceptional, whereas it is frequently complicated with syphilis and gonorrhœa.

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[1] We must leave a further development of this doctrine to oral instruction. Dr. Mohr, in his Contributions to Pathological Anatomy (Stuttgart, 1838, p. 131), quotes, in connexion with this subject, an authority which is quite foreign to the matter.

d. The Dysenteric Process.[1]—We are acquainted with the dysenteric process as a substantive disease of the mucous membrane of the colon, and inasmuch as it is here presented in its most exquisite form, its habitat has been correctly fixed ever since the days of Hippocrates.

The dysenteric process is divisible into four natural degrees or forms.

In the lowest degree, the mucous membrane commonly presents a layer of a thin secretion, of a dirty gray and reddish colour, underneath which, certain parts, commonly the projecting folds of the mucous membrane, are reddened and swollen. In this manner striæ are produced, which more or less encircle the intestine. The epithelium is either raised in the shape of small vesicles which contain clear serum, or it forms a grayish-white layer, resembling the mealy scurf of the epidermis, an appearance which probably induced Linnæus to term dysentery *Scabies intestinorum interna.* The subjacent mucous membrane seems excoriated, slight pressure induces hemorrhage, and it may be easily detached in the shape of a light red sanguineous pulp; its submucous cellular tissue appears infiltrated.

The anatomical characters may be summed up as—swelling, injection and reddening, softening (red and bleeding), serous exudation in the shape of a delicate vesicular eruption, and consequent branny desquamation of the epidermis.

In the second degree, the textural alterations are not limited in the manner described, but extend over a larger surface, still, however, presenting a greater development at one part than at another. The mucous membrane is invested to the same extent, by a dirty-gray layer, consisting of desquamated epithelium and a thick glutinous exudation ; or this may already have been removed, and the subjacent mucous membrane, in either case, appears converted into a soft, sanguineous, pale red and yellowish gelatinous substance, which may be easily detached. The internal surface of the intestine commonly presents more or less numerous protuberances, which closer examination proves to consist of a very copious infiltration of the submucous cellular tissue : these projections or tumours were first observed by Hewson and Pringle ; other authors speak of them as warty tubercular swellings, or fungoid excrescences, and M. Gély has lately termed them *Hypertrophie mamelonnée du tissue sousmuqueux.*

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[1] Vide Oestr. Jahrb., xx, 1.

They correspond to those points of the mucous membrane at which the morbid affection is most developed; with the exception of slight redness and intumescence, especially in the circumference of the follicles, an increase in the mucous secretion, and a slight desquamation of epithelium, the intervening parts of the mucous membrane do not generally offer any marked textural changes. The entire portion of intestine is generally in a state of passive dilatation; it is distended with gas and with a dirty brown fluid, which consists of the most different materials, such as intestinal secretions, epithelium, lymph, blood, and fæces; its coats are thickened, and the submucous tissue particularly is in a state of tumefaction.

At this stage we meet with the laminated and tubular coagula in the evacuations, described by ancient and modern authors, especially if the exudation be of a more plastic character.

Occasionally the affection of the follicles predominates and is accompanied by irritation, exhausting secretions, and softening: these probably constitute the characteristic signs of the so-called catarrhal or white dysentery, but which, in an anatomical point of view, is the same follicular affection of the colon as that which we have already described as accompanying chronic diarrhœa.

In the third stage, we find the protuberances more closely set, so as to produce an uneven, lobulated appearance. The mucous membrane that invests these protuberances partly retains the above-described conformation; in part it is converted into a slough, which is here and there blended with the desquamated epithelium and the exudation, and is firmly attached to them; it is of a dark-red or blackish-brown, sugillated, or grayish-green colour; or the mucous membrane may have disappeared, so as to expose the infiltrated submucous cellular tissue to which the remnants of the mucous membrane remain attached in the shape of solitary, dark-red, flaccid, and bleeding vascular tufts, or as dilated follicles, which are easily removed. The interstices of the mucous membrane are the seat of the affection in a lower degree.

The protuberances occasionally are found to have coalesced, and the intestine then presents an uneven plicated surface, accompanied by an equable degree of infiltration and thickening of its parietes; the mucous membrane is uniformly affected over a large extent, and there are no free interstices.

The contents of the intestine are of a dirty-brown or reddish, ichorous, fetid, flocculent and grumous character.

In the fourth and highest degree, the mucous membrane degenerates into a black, friable, carbonified mass, which may often be subsequently voided in the shape of tubular laminæ (so-called mortification of the mucous membrane). The submucous cellular tissue appears to be previously infiltrated with carbonified blood, or a sero-sanguinolent fluid; or it is pallid, and the blood contained in its vessels is converted into a black solid or pulverulent mass: subsequently it shows purulent infiltration, in consequence of the reactive inflammation which is induced in the lower healthy strata, for the purpose of eliminating the gangrenous portions.

The affected portion of intestine, which contains a putrid, brownish-black fluid, resembling coffee-grounds, may appear in a state of passive dilatation, as above described, but it is much more frequently collapsed; and if the two highest degrees continue for any length of time, the muscular coat will be reduced. The tissue of the latter is condensed, pale, ashy, peculiarly elastic and friable, and analogous to the yellow fibrous tissue.

The peritoneal coat presents, in the higher, and particularly in the highest degree of the affection, a dirty-gray discoloration, and a total absence of lustre; at intervals it presents a dilatation and injection of its capillary vessels, and is invested with a brownish, ichorous exudation; occasionally the mesocolon, and even the mesenteric laminæ, that have been in contact with them, participate in the affection. This affords a means of distinguishing dysenteric disease of the intestine on its outer surface.

The glands of the mesocolon present a corresponding tumefaction; they are of a dark-blue colour, congested, and tumefied; but we have not succeeded in detecting in them a peculiar (specific) solid morbid product, as we have in typhus.

The mucous membrane of the colon is, as we have already observed, the seat of the dysenteric process; and we may state it as a rule, that its intensity increases from the cæcal valve downwards, and consequently is met with, in the most fully-developed state, in the sigmoid flexure and in the rectum. It not unfrequently passes beyond the cæcal valve, towards the ileum, but is here only seen in its mildest form.

It commonly runs an acute course, though it is frequently chronic in the milder degrees; this however does not materially alter its character.

The manner in which it terminates varies.

1. The disease is fatal, in consequence of the more or less rapid, or more or less penetrating destruction of tissue, and the coincident exhaustion.

2. The disease may terminate in cure, if the mucous membrane has not become disorganized in the manner above described, the normal cohesion returning, and a new layer being generated under the desquamated epithelium.

3. In the higher degrees of the disease, when disorganization has occurred in one of the above-described processes, and the mucous membrane has suffered more or less extensive destruction, one of two results ensues:

a, A real cure of the loss of substance, with consolidation of the abraded portions of the intestine, follows; or,

b, The entire process assumes a low chronic form, the specific nature of the disease is lost, and we have atonic inflammation and suppuration of the intestinal coats.

If a cure ensues, the portions of mucous membrane which were affected in a lower degree are first restored to their normal condition; between them are small patches, or more extensive spaces, with a sinuous circumference, at which the mucous membrane is deficient, and the submucous, pale, infiltrated cellular tissue is exposed. Not unfrequently we perceive detached remnants of mucous membrane adhering to these parts. The exposed submucous cellular tissue is gradually converted, as proved by cadaveric examinations at the most various periods after the cessation of dysentery, into serous tissue; this is further condensed into sero-fibrous tissue, and by it the sinuous portions of mucous membrane, at the edge of the impaired surface, are, like the isolated remnants of mucous membrane, compressed into warty, pediculated (polypous) prolongations, and thus the originally sinuous circumference obtains a fringed, dentated appearance. In cases in which the loss of substance is inconsiderable, the new tissue may contract so as to bring the edges of the mucous membrane into apposition with one another and with the polypous remnants of mucous membrane, and the cicatrix is then represented by a large number of agminated warty excrescences of the mucous membrane, between which the sero-fibrous basis from which they proceed, may be detected.

In cases of extensive destruction of substance, the approach of the edges is rendered impossible; the deeper layers of the tissue, which takes the place of the mucous membrane, is frequently condensed into fibrous bands, which form corded projections into the intestinal cavity, interlace with one another, and not unfrequently encroach upon the caliber of the intestine in the shape of valvular or annular folds, thus giving rise to a stricture in the colon of a very peculiar form. This mode of regeneration is the more remarkable, as it closely resembles that following the destruction of the œsophageal mucous membrane by mineral acids.

In the second case the specific affection terminates after having previously given rise to more or less extensive disorganization, but without being followed by the healing process just described. The entire disease now assumes a chronic character, and appears on the residual portion of mucous membrane as chronic catarrhal inflammation, the follicles being more or less prominently affected, and suppuration occurring in the shape of sinuses and abscesses under the mucous membrane, and between the external coats of the intestine; at the same time the intestinal canal contracts, its coats assume a rusty, dark-blue colour; there is occasional exacerbation of the peritoneal irritation, and the intestine becomes fixed in consequence of exudation and infiltration in its cellular sheath and its mesentery. In this case the mucous membrane is found of a dull, red colour, tumefied, and invested by a copious secretion of a glairy or purulent character; the follicles, particularly those at the end of the colon, are dilated, distended by a glassy pituita, or in a state of suppuration; there are small abscesses, of the size of a hemp-seed or pea, under the mucous membrane, and in the cellular tissue lying between the muscular fibres. These abscesses open upon the mucous membrane by the suppurating follicles or by other minute orifices, forming fistulous passages in various directions, and penetrating into deeper parts, so as to reach the peritoneum, and there induce inflammation; or they give rise, in the vicinity of the rectum, to the formation of large abscesses, as described by Morgagni.

The concurrent contraction of the intestinal tube probably causes in this case, also, a diminution of its caliber, but this form presents no peculiarity to distinguish it from the effect which may be produced in every case of catarrhal inflammation attended by repeated exacerbations. (Vide p. 65.)

The dysenteric process occurs in its exquisite and primary form in the colon only, with the exception of the mucous membrane of the female sexual organs, where it affects the uterine mucous membrane in the shape of the puerperal disease.

The dysenteric process offers the greatest analogy to the corrosion of the mucous membrane produced by a caustic acid. The consequent destruction of the tissues, as well as the phenomena of reaction, present throughout a close resemblance in both cases, and the stricture produced in the œsophagus has no analogue but that resulting in the colon from the dysenteric affection.

We have found a further analogy with the dysenteric process in the erodent effect produced upon the mucous membrane of the œsophagus by the gastric juice in scirrhous stenosis of the pylorus.

Appendix.—The Non-typhous Intumescence of the Follicles and Villi of the Intestines.

Although the intumescence of the intestinal follicles occurring in various morbid conditions is not the consequence of palpable inflammatory action, it may yet be fairly considered at this place, as it commonly appears to result from the relation of certain general morbid states to the follicular apparatus.

We find that the patches of Peyer in the small intestine, the solitary follicles of the small and large intestine, and the follicles of Lieberkühn, in the small intestine, may be affected in this manner. The affection is observed:

1. In substantive affections of the intestinal mucous membrane, as in diarrhœa, and particularly when occurring in children, in whom it is marked by more or less vascularity and

congestion, but frequently also by an anæmic condition of the parts. In the diarrhœa of children and young persons we find, besides an enlargement of the solitary and of Peyer's glands, a dilatation of Lieberkühn's follicles; a grayish-white creamy matter accumulates in their interior, which produces a whitish punctiform appearance in the intestinal mucous membrane, or, in transmitted light, gives rise to so many opacities.

2. The affection occurs most frequently as a reflex of constitutional disease: under these circumstances, the swellings of the solitary and of Peyer's follicles are found principally in the colon in typhoid gastro-enteric fevers, as an imperfectly-developed secondary typhous eruption in almost all the exanthemata, but especially in scarlet fever, variola, and erysipelas; in acute rheumatism and gout; in croup; in suppurative and gangrenous disease; in febrile affections of the lymphatic glands in scrofulous individuals; in hydrocephalic fever; in a marked form in common Asiatic cholera; and lastly, in acute convulsions, trismus, and tetanus. The villi are generally also much swollen, but we invariably find the mesenteric glands in a state of tumefaction.

Swelling of the follicles is the consequence of a deposition of a grayish-red, dull-white, or yellowish substance, of a lardaceous or creamy and glutinous consistence in the cavity of the follicle, accompanied by an analogous infiltration of its parietes; thus the follicle and the deposit not unfrequently appear to constitute an homogeneous body, to which the term "granulations of the intestinal mucous membrane" has been applied. This follicular affection differs from that occurring in typhus in everything that characterises the latter, and especially in reference to the metamorphosis of the typhous follicle.

According to the predisposing constitutional causes, the affection we are treating of is more or less acute and transitory; the deposit, the follicular tissue, and the mucous membrane in very rare cases fuse into a small shallow ulcer; induration and a further development occasionally take place, and the mucous membrane being pushed forwards, a species of polypoid pediculated growth is formed.

3. *Gangrene of the mucous membrane.*—We have had occasion to examine the ulcerative process consequent upon in-

flammation in a variety of forms, and any further investigation of the subject were superfluous. We pass at once to gangrene of the mucous membrane, although we must observe that it rarely is a direct consequence of inflammation.

Gangrene of the mucous membrane is brought on by compression and traction, and is generally accompanied by gangrene of the other intestinal coats, as in incarcerated hernia at the point of strangulation, or in consequence of excessive dilatation of a portion of intestine above a stricture, at various scattered points; it may occur in large patches in consequence of mechanical hyperæmia brought on by incarceration, or of passive congestion induced by paralysis; it may take place in the shape of a circumscribed slough of the mucous membrane consequent upon inflammatory action (gangrenous inflammation strictly so called), in which the peculiar anomalous state of the blood and the peculiar nature of the product, are the cause of mortification. To this head belong the sloughs of the intestinal mucous membrane, which occur with symptoms of general adynamia and putrescence, in acute dyscrasia of the blood, in purulent and ichorous infection of the blood, under the form of degenerated typhus, cholera typhus, &c.

After the slough has become detached there is a loss of substance in the mucous membrane which demands some attention, as it may be confounded with an intestinal ulcer; the diagnosis is established by the existence of an external or internal cause of gangrene, or by a correspondence, in seat and form, between the latter and the external influence (compression, traction); again, the slough of gangrenous inflammation is distinguished by its oblong, striated form, and very varying seat, by its defined contour, and by the absence of morbid growth at the edge, at the base, as well as in the circumference of the eroded part.

4. *Inflammation of the submucous cellular tissue.*—In several of the processes we have hitherto considered, we have had occasion to notice the various modes and degrees in which the submucous cellular tissue is involved in disease of the mucous membrane. An isolated inflammation of the submucous cellular tissue is very rare, and when it does occur it is commonly metastatic and terminates in suppuration. It takes place in the

shape of distinct foci of varying extent, which either give rise to perforation of the mucous membrane, or advance towards the peritoneum, and here produce peritonitis; or in certain portions of the intestine, as in the cæcum, colon ascendens and rectum, produce extensive suppuration of the cellular tissue.

5. *Softening of the intestinal canal.*—We may pass over the softening of the intestinal mucous membrane which we have described when treating of the Exudative Processes and Dysentery, as converting the tissue into a pulp, which, in proportion to the state of vascular action, and to the quality of the exuding matters, is either easily removable or is spontaneously detached. We have here to allude to the gelatinous ramollissement of the intestinal mucous membrane which offers an analogue to the gelatinous oftening of the gastric mucous membrane. It is of much rarer occurrence than the latter, though like this, it affects the small intestine as a complication of cerebral disease, of acidity in the primæ viæ, of extreme general collapse, atrophy of the muscular tissue, and anæmia of the intestine; it involves the external coats of the intestine, converts them into an homogeneous, grayish-red, transparent, and deliquescent gelatine, and leads to spontaneous perforation. We also advert to the analogue of black softening of the stomach, which occasionally, though much more rarely, attacks the intestine. It occurs under the same conditions, and mainly affects the mucous membrane of the cæcum, and in this case occurs, like gelatinous softening, on the cellular base of the typhous ulcer.

6. *Morbid growths in the intestinal canal.*—Under this head we consider lipoma, the formation of an anomalous, serous, and fibro-serous tissue, fibrous and fibro-cartilaginous tissue, calcareous concretions, erectile tissue, tubercle, and scirrhus.

a. Lipoma occurs of various size in the shape of lobulated accumulations of fat in the submucous cellular tissue. It forms rounded tumours which are invested by mucous membrane, project into the intestinal canal, and are sessile, or pediculated: in the latter case they push the mucous membrane before them in the course of their development, and become suspended by a pedicle of mucous membrane. Although presenting a polypoid shape, they must be carefully distinguished from true polypus.

b. Anomalous serous and fibro-serous tissue occurs as a temporary or permanent substitute of loss of tissue in the mucous membrane, and in very rare cases in the shape of serous and fibro-serous cysts between the intestinal coats.

c. Fibrous and fibro-cartilaginous tissue is found in the submucous cellular tissue of the stomach, and less frequently, of the œsophagus; it assumes the shape of the rounded or oval, flattened concretions of a bluish-white colour, and elastic and firm consistence, which we have described above. They do not attain a greater size than that of a lentil or pea, and are freely moveable under the mucous membrane.

d. Chalky concretions more or less resembling bone, though destitute of its peculiar organization (so-called ossifications), occur very rarely in the intestinal canal. If we sum up the results of the observations made in reference to this point, taken in connexion with our incidental remarks when considering the diseases of the peritoneum, we arrive at the following deductions:

α, The concretions occur as lamellæ or delicate cords in the sero-fibrous tissue which is formed supplementary to a loss of mucous tissue;

β, As ossification of the fibroid tissue occurring in the submucous and subserous cellular layers;

γ, As a loose chalky concretion or indurated calcareous pus between the intestinal coats in sinuses accompanying catarrhal intestinal phthisis;

δ, As calcareous tubercle of the intestinal mucous membrane or the peritoneum;

ε, As ossification of peritoneal exudation on the intestine.

e. Erectile tissue occurs as a pediculated polypus (mucous or cellular polypus), or in the shape of large, broad, sessile tumours, chiefly as a consequence of catarrh in the colon and rectum. It may in this case also be the seat of medullary carcinomatous infiltration.

f. Tubercle.—The presence of tubercle in the tissue of the intestinal mucous membrane, and by extension, in the deeper-seated coats, constitutes a most important disease—tuberculosis of the intestine in the wide, tuberculosis of the intestinal mucous membrane in the narrower sense. It may proceed to ulcerative destruction, and this establishes genuine intestinal phthisis.

Amongst ourselves this affection rarely occurs in the idiopathic form, except during the first years of life. It is commonly the consequence of pulmonary tuberculosis, and in the majority of cases, takes place after the latter has attained the suppurative stage (pulmonary phthisis), and the general tubercular cachexia has become fully developed.

The course it runs is frequently chronic, but much oftener acute : the latter is more particularly the case when it follows the tumultuous fusion of numerous pulmonary tubercles. The tubercular deposit offers corresponding varieties in reference to its original form, its seat, and its metamorphosis.

In the chronic affection we find the mucous membrane, and the adjacent layer of submucous cellular tissue, to be the original seat of the tubercular deposit; there is no perceptible inflammatory action, and the disease appears in the shape of the gray, transparent, tubercular granulation, which softens at its centre, and is gradually converted from within outwards, into the yellow cheesy tubercle. It seems blended with the mucous membrane, and projects into the intestinal cavity in the shape of a sessile, hard nodule.

When the local appearance of tubercle takes place in the acute form, there is considerable inflammatory action. The deposit is effected similarly to that occurring in the pulmonary cells; in the first instance it is deposited in the cavity of Peyer's glands, then into the solitary follicles, and lastly, in every other part of the intestinal mucous tissue; it appears in large masses, and in the shape of yellow, cheesy matter, which speedily undergoes a purulent transformation. The surrounding tissue is found extensively congested, reddened and turgid; and when the deposit is excessive, the mucous membrane of an entire coil may be in a state of congestion and irritation. In this case tubercular tumours, either scattered over the surface of the intestine or more or less accumulated, are found occupying Peyer's patches, offering considerable projections and distinguishable through the mucous membrane by their yellow tinge.

Tubercular deposit in the intestinal mucous membrane, being the result of a fully-developed tubercular cachexia, commonly advances rapidly to softening, and this process is effected with peculiar violence in the second variety. The investing mucous membrane gives way at its most elevated point, and as the orifice enlarges, the suppurating tubercular matter escapes.

A cup-shaped ulcer, of the size of a millet seed or a pea (the primary tubercular ulcer) results; its margin is firmly attached, rounded and indurated, and of a pale or red colour in proportion to the reaction that occurs in the surrounding tissue; its base is either formed by the condensed submucous cellular layer, or by the granulated texture of the parietes of the dilated follicle. It is only in very rare cases that the tubercle fuses under the mucous membrane without giving rise to perforation; it then forms at the expense of an inclosed abscess, which enlarges the submucous cellular tissue (vomica submucosa).

The increase of the ulcer takes place with more or less rapidity, it loses its original form, but only to exchange it for a more characteristic secondary one.

The increase is effected by fusion of the tubercular infiltration of the margin of the ulcer, and by concurrent suppuration of the tissue. In the first instance, the small adjoining ulcers coalesce into one of larger size; the common base presents sinuous projections of the common margin of mucous tissue, ridges of mucous membrane may be seen traversing it in various directions, or even solitary insular remnants of this tissue are found upon it.

If this process has occurred, as it does in acute intestinal tuberculosis, in one of Peyer's patches, the ulcer may, on account of the elliptic form prescribed by the shape of the glandular apparatus, be mistaken for a typhous ulcer, but we shall immediately point out that the peculiar relations of the margin and the base afford a satisfactory clue to the diagnosis.

The ulcer, which is formed by a coalition of other smaller ulcers, enlarges in the same manner as the original solitary ulcer, in the direction of the intestinal circumference, and at last presents a zone of varying width and uniformity. Its margin is sinuous or dentated, inverted and tumid, and is formed by mucous membrane of a light red colour; from the latter being infiltrated with a transparent gelatinous substance, an analogy is offered with the gelatinous infiltration occurring in the vicinity of tubercular pulmonary abscesses. The base is formed by callous cellular tissue of a dirty white colour, underneath which the remaining intestinal layers are found similarly condensed and tumefied.

Both in the marginal tissue and at the base we find a deposition of gray, or more commonly of soft, yellow, tubercular matter. The ulcer presents a very peculiar appearance, on account of the remnants of mucous membrane seen on its base. These adopt the characters of the margin, and become infiltrated with gelatinous matter, so as to form crispated, transparent, condylomatous excrescences of a light-red colour.

In the same manner as the tubercular ulcer extends laterally, it may advance in the opposite direction, and thus giving rise to perforation, cause sudden death. Secondary deposition of tubercular matter may equally take place in the callous cellular tissue of the base, and as it fuses at this point, in the muscular and subserous layers also. The peritoneum may become perforated in consequence of tubercular suppuration being established in it, or in consequence of mortification induced by the approach of an abscess. It follows that the tubercular ulcer perforates the intestinal parietes without losing its original character, inasmuch as the progress of the tubercular affection is not arrested by an isolating tissue; in this it differs from the typhous ulcer, which does not perforate the intestine in its original form, but affects the parts beyond the submucous cellular tissue in its degenerated character.

At an earlier or later period we find moderate inflammation attacking points of the peritoneum which correspond in position to the intestinal ulcer; a fibrinous exudation results, which is entirely, or in part, converted into tubercle; in the latter case it is partly converted into cellular tissue. By the intervention of this new product an adhesion is often effected at the point of ulceration, between the intestine and a neighbouring organ, e. g. the bladder, the omentum, and thus a more or less substantial impediment is offered to the free discharge of the intestinal contents into the peritoneal cavity on the occurrence of perforation.

The mesenteric glands, lying in the vicinity of the affected portion of the intestine, are variously enlarged: in the primary intestinal tuberculosis of children they frequently attain the size of a walnut or hen's egg; they appear tuberculated and pale, and present a deposition of grayish, medullary, and hard, or of yellow, grumous, and deliquescent, tubercular matter.

The small intestine is the common seat of intestinal tuberculosis, and in most cases the disease is limited to this part; still it often passes on to the colon and descends to the rectum, or it ascends into the jejunum, and in very rare cases mounts to the duodenum and the stomach. Sometimes it is much advanced in the colon, and then appears to have been first developed at this point and subsequently to have extended to the small intestine.

We may gather from the circumstances accompanying intestinal tuberculosis, that the further it has advanced the less a cure is to be hoped for. Still in the same manner as in the tubercular abscesses of the lungs, we sometimes observe a healing process established in a few among a large number of ulcers. It takes place in the following manner.

The first indispensable condition is the cessation of all secondary tubercular infiltration at the margin or base of the ulcer; the callous base is then condensed into a fibro-medullary cord, and the edges of the ulcer approach one another. This process sometimes advances so far, that the dentated edges almost touch, and between them a whitish, callous cord may be observed. Occasionally, the edges are soldered together over the callosity, yet so as to leave a fissure at one end of the ulcer. In very rare cases an entire consolidation is effected.

In consequence of the contraction of the ulcer, a cicatrix forms on the surface of the intestine, which presents a more or less elevated tumid ridge on the internal surface of the intestine. If the ulcer was of considerable size, or if it encircled the entire intestine, a callous annular ridge remains, which diminishes the caliber of the intestine, and when viewed from without, occasionally gives rise to an appearance of invagination.

Thus the cure of a tubercular intestinal ulcer is always accompanied by a diminution of the intestinal caliber.

g. Scirrhus, carcinoma of the intestine.—The carcinomatous affections of the intestine, occur in the three forms of fibrous, areolar, and medullary cancer, with and without the formation of pigment: two of these or all three, may be combined with one another, from their first origin or consecutively. The areolar form however is, at least with us, of very rare occurrence.

The colon is almost exclusively the seat of cancerous degeneration, but there is a gradation in the proclivity of its different sections to the affection. The rectum is most frequently attacked, in second order the sigmoid flexure, and the remaining portion of the colon but rarely. The small intestine is scarcely ever the primary seat of cancer; it is almost always involved secondarily after adhesions have been effected with a cancerous portion of the colon by means of peritoneal exudation. Medullary carcinomatous cachexia, which is frequently acute and very extensive, forms an exception, inasmuch as it gives rise to a medullary, white or coloured infiltration of the mucous membrane of the small intestine and its submucous cellular tissue in the patches of Peyer. If we except this case, carcinoma occurs as a primary affection of the intestine in three forms:

Firstly, In the mucous membrane, as carcinomatous infiltration of the erectile tissue, into which the former has been previously converted—fungus;

Secondly, More frequently in the submucous cellular tissue, as round nodulated accumulations;

Thirdly, Most commonly as an annular deposit of the cancerous tissue in the submucous cellular layer.

When the intestine is secondarily involved, it is attacked laterally, and the disease commonly proceeds from the lymphatic glands of the mesentery, or from those of the lumbar plexus.

A distinction of the two latter forms is of importance, in reference to the observations that we are about to make.

Here also, carcinoma presents the well-known stages of crudity and metamorphosis; and we merely direct attention to this again, because a consideration of the fact is absolutely necessary for a complete exposition of cancerous intestinal stricture, which, next to cancer itself, is of extreme interest.

Cancerous stricture of the intestine[1] (Enterostenosis scirrhosa, cancerosa) is the most common variety of stricture that results from alterations in the intestinal coats, and at the same time the one that advances to the highest degree; it also offers the first elements for a rational theory of ileus.

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[1] Oestr. Jahrb., xviii, 1.

We have already alluded to the two main forms in which cancer affects the intestine: it is either a narrow annular tumour surrounding the intestine, the primary form, which gives rise to annular stricture; or the intestine is secondarily affected by a propagation of the disease from neighbouring organs; in this case one side only may be involved to a considerable extent. In the latter case however the cancerous degeneration may gradually extend over the entire circumference of the intestine, as in the former the original annular stricture may extend upwards or downwards over a larger portion of intestine.

The annular stricture is commonly the most important; if the morbid growth continues in the crude stage, the caliber of the intestine may be reduced to the size of the little finger, a goose's or crow's quill. The passage of the intestine is frequently much interfered with in the lateral degeneration by protrusion of the morbid growth, but there is generally a corresponding dilatation of the normal portion of the parietes, and the width of the tube is thus not unfrequently found increased, even after the morbid growth has enveloped the entire circumference of the intestine. Although the former is by far the most dangerous, and soon proves fatal by ileus, this also follows sooner or later in the second case, notwithstanding the existing dilatation.

The metamorphosis of intestinal cancer is of importance in reference to the stricture, both in its first development and in its further progress; it may render the stricture much more dangerous, or may lead to a certain improvement in the symptoms. The turgescence that takes place in the morbid growth at the commencement of the change, and the fungous excrescences that arise on the surface of the intestine during its progress, may render the stricture narrower, and even induce perfect occlusion of the intestine. On the other hand, the contraction may be relieved by sloughing of the softened morbid growth, and imminent ileus thus be postponed. The intestinal disease may, unless death ensue, as it often does from exhaustion, be subsequently ameliorated in various ways. After destruction of the morbid growth, an ichorous cavity is left, into which the descending contents of the intestine pass and stagnate; this condition is sometimes borne for a considerable period, provided there is a sufficient discharge downwards. In other cases ulcerative perforations may establish one or more communications between the portions of intestine lying above and below the stricture, or ulcerative destruction may take place in a different direction, and give rise to artificial (vicarious) anus; thus affording a hint as to the mode of cure to be adopted by the medical man.

The degenerated and strictured portion of the intestine may remain unattached, or become fixed. The primary degeneration of the intestine, exhibited in annular stricture, is commonly unattached, and it then, in proportion as the diseased mass increases, sinks to a lower region of the abdominal cavity. This may, in the same manner as the scirrhous pylorus, when it has descended to the umbilical or hypogastric regions, give rise to an error of diagnosis. The dislocation is particularly liable to present an obstacle to the passage of the intestinal contents, if the contracted portion is bent at an acute angle, as occurs in the descent of strictured portions of the transverse colon, or of the flexures of the colon.

The diseased portion of intestine may be fixed, as is the case in the secondary lateral degeneration of the intestine from its commencement; the annular stricture may become attached in the same, or in a different manner. In the former case the intestine is either directly connected with the large lobulated morbid growths that extend to the glands of the lumbar plexus, or even to the ligamentous appendages and the periosteum of the vertebræ (Lobstein's retroperitoneal growths), or it is attached to them by the intervention of a cord or peduncle which passes through the mysentery. In consequence of the partial contraction of the tissues, and especially of the intestinal coats, and of the unequal distribution of the morbid growth, the degenerated portion of the tube is more or less inflected.

The annular stricture, which in the first instance is unattached, may, as the cancer advances, become fixed in a similar manner at the point of its original development, or at different parts at a distance from this point, either by cellular tissue, or by a fusion of the carcinomatous tissues. The propulsion of the intestinal contents will, in that case, be impeded to a greater degree than in simple dislocation, and the more so, the greater the dislocation itself, the more acute the angle of inflection, and the more firm the adhesions are.

The intestine lying above the diseased portion is found affected to a various extent, and commonly in proportion to the amount of contraction, by active dilatation, i. e. dilatation accompanied by hypertrophy of the muscular coat. The parietes of this section of the intestine are occasionally found very much thickened and indurated; the muscular coat presents a yellow discoloration and is friable, the cellular layers are infiltrated with a gelatinous medullary substance, the mucous membrane is thinned and resembles a serous membrane, and the contents of the intestine accumulate to a considerable extent above the affected point. The portion of intestine which lies below the cancerous mass is more or less permanently contracted and empty.

In considering the metamorphosis of intestinal scirrhus, we have adverted to its terminations; it commonly ends fatally with symptoms of intestinal inflammation and ileus.

Cancerous ulceration, more frequently than any other variety of ulceration, gives rise to communications between the affected portion of intestine and neighbouring cavities and passages, and more especially with the rectum.

Intestinal carcinoma often occurs in the isolated form, but it is not unfrequently complicated with cancer of the stomach, the liver, the lymphatic glands, and the bones, with osteomalacia, and universal cancerous cachexia.

There are certain ulcers which occur only in the large intestine, and especially in the sigmoid flexure and the rectum, and are nearly allied to cancer, and particularly to cutaneous cancer. They are generally solitary, but there may be two, three, or four at a time. They invariably give rise to intense pain, and appear etiologically connected with an abuse of ardent spirits. Although in many respects analogous to the ulcers hitherto considered, they offer distinctive characters. They are invariably zonular and have a callous base, upon which occasionally a discoloured, brownish, grumous discharge is visible, and they are surrounded by a thick tumid, spongy, carneous, and irregularly-sinuous margin of mucous membrane. They generally cause a diminution of the capacity of the intestine, though not to any considerable degree. A further investigation into their nature still remains a desideratum.

7. *Theory of the ileus produced by cancerous degeneration of the intestine.*—Independent of the degree of stricture, the degenerated portion of the intestine, owing to the adventitious growth deposited in the submucous tissue, and still more from the consequent disorganization of the muscular coat, is in a completely passive condition. The propulsion of the fæces through this portion is therefore effected by the muscular activity of the higher part of the intestine, even when the lateral position of the disease allows of dilatation. The more considerable the stricture, or the more extensive the growth, and the more copious the feculent accumulation, the more will this activity be called into play.

The contents of the intestine necessarily stagnate and accumulate in that portion which lies immediately above the diseased point, and dilate it. If the dilatation is effected suddenly, paralysis at once ensues; otherwise the accumulated masses, a certain portion of which are only propelled through the degenerated section of the intestine, give rise to reaction, hypertrophy of the membranes follows, and as these influences increase, gradual exhaustion and paralysis result. This paralysed portion of intestine is the proximate cause of the supervening ileus. As soon as the fæces have accumulated within it to such an extent as to reach the adjacent sound portion of intestine, the latter undertakes their discharge. Its capability of effecting this will diminish in proportion to the amount of accumulation, and to the contraction of the stricture. The consequence is, that the peristaltic action is reversed, and that the antiperistaltic movement conveys the intestinal contents to the stomach, from which they are ejected by vomiting.

The coexistent intestinal inflammation, which commonly occurs as general peritonitis, also has a share in the process. It commences at that point immediately above the stricture, which has become most dilated by the accumulated contents, and it is there most intense. This portion of intestine presents a dark blue or blackish-red discoloration, with a tinge of brown or green; its coats are infiltrated with blood; the peritoneal investment, which is covered with a dirty green or brownish exudation, is easily detached; the muscular coat is discoloured and friable; the mucous membrane, owing to its distension, is devoid of plicæ, villi, or follicles; dark red, distended at some parts with coagula, and sloughy. Sometimes all the intestinal coats are perforated at these points, and there is consequently an extravasation of the intestinal contents into the abdominal cavity.

The inflammation extends from this portion of the intestine upwards, and is followed, *pari passu,* by paralysis. It passes from the intestine to the mesenteries, to the omentum, and to the parietal laminæ of the peritoneum.

In some cases the inflammation is the result of irritation existing in the morbid product, which is transferred to the peritoneum, and causes paralysis of the muscular coat above the stricture, dilatation of the intestine and ileus.

It follows that, to appreciate the causes of ileus arising from scirrhous strictures of the intestine correctly, we must take into consideration:

Firstly; the absolute degree of stricture.

Secondly; the degree of attachment of the affected portion of intestine, with or without dislocation and inflection.

Thirdly; the degree of the consecutive affection of the part above the stricture.

Fourthly; the degree of inflammation present.

Appendix.—Diseases of Separate Sections of the Intestinal Canal.

Separate sections of the intestine demand special attention, inasmuch as not only many diseases occur more frequently at one part than at another, and are subject to numerous modifications in reference to their issue and result, but as many diseases exclusively affect one portion of the intestine. We shall consider the diseases of the duodenum, of the cæcum and vermicular process, and of the rectum, separately, on account of their peculiar importance.

a. Diseases of the duodenum.—We frequently meet with cellular adhesions between the upper transverse portion of the duodenum and the concave surface of the liver and the gall-bladder.

The mucous membrane of the duodenum not unfrequently bulges out through the muscular coat in the shape of a *hernial diverticulum*, an occurrence which is undoubtedly favoured by the absence of the peritoneal investment.

Catarrhal irritation, and even inflammation, undoubtedly often affect the duodenal mucous membrane, and are frequently induced by an anomalous condition of the bile. It appears that they may extend to the biliary ducts, and induce icteric symptoms by a retention of the bile (Stokes). We often find evidence of chronic catarrh or blennorrhœa of the mucous membrane in the dead subject, accompanied by brownish-red or slate-gray discoloration, by hypertrophy of the mucous membrane and Brunner's glands, and by the formation of polypi.

As regards ulcerative processes, we find, besides tubercular ulcer, which is very rare, the perforating ulcer occurring at the upper transverse portion (vide perforating gastric ulcer), and perforation resulting from an extension of the process from the gall-bladder to the duodenum.

Carcinoma very seldom occurs in any shape as a primary affection of the duodenum; it is sometimes secondarily attacked posteriorly by an extension of the disease from the cancerous lymphatic glands surrounding the head of the pancreas and the gall-ducts.

b. Diseases of the cæcum and the vermicular process.—The cæcum and the vermicular process are occasionally absent, or are only imperfectly developed; in some cases the former has been found fissured (Fleischmann).

Anomalies in the position of the cæcum are confined to its position on the left side in lateral dislocation of the abdominal viscera, and to its position in large inguinal or umbilical hernia. Its attachments are sometimes very loose, and this appears to result from repeated dilatation.

Catarrhal inflammation of the cæcal mucous membrane is remarkable on account of the frequency of its occurrence, and that form which is occasioned by habitual constipation, so-called typhlitis stercoralis, is peculiarly characteristic. It chiefly originates in sedentary habits, indigestible food, and rheumatism of the muscular coat. The symptoms are those of catarrhal inflammation generally; it runs an acute course, is subject to frequent relapses, and degenerates into the chronic form. Removal of the accumulated pus, and avoidance of fresh accumulations, generally suffice to establish a cure. If this is not effected, ulcerative destruction of the mucous membrane, and continued sinuous suppuration of the muscular coat, result. In this manner rapid perforation of the intestinal parietes, and especially of the posterior side, may follow, either inducing extensive inflammation, ichorous destruction of the cellular tissue in the iliac and lumbar regions and death; or giving rise to general peritonitis, in consequence of the destructive process passing from the right iliac region in a different direction.

In the chronic form the cellular tissue at the posterior surface of the intestine condenses, and the adjoining muscular coat and the entire cæcum shrivel up; on cessation of the ulcerative process, the cæcum is found converted into a slate-coloured capsule, with dense parietes, of the size of a walnut or a pigeon's egg; in the place of the mucous membrane there is a sero-fibrous, retiform and trabecular tissue.

In reference to the cæcum we observe, that the inflammation of the loose, stringy, cellular tissue external to the iliac fascia, (perityphlitis), is of considerable importance. It is occasionally idiopathic, but more frequently metastatic; it is very dangerous, both on account of the facility with which the pus spreads, and on account of the perforation of the cæcal parietes which may ensue, and the consequent extravasation of intestinal contents into the seat of inflammation.

The vermicular process is sometimes reduced to a mere cellular sinus of the cæcum; it varies in size from that of an insignificant nodule to five or six inches.

There are considerable variations in the position of the cæcum.

Adhesions of its free extremity may become a matter of importance, by forming rings or fissures in which the intestine is strangulated.

Catarrhal inflammation of the vermicular process is a disease of common occurrence, and very dangerous on account of its consequences. It much resembles typhlitis stercoralis, and is invariably the result of fæcal matters and foreign bodies, especially small fruit-stones, having become lodged and hardened in it.

The affection has a torpid character, may exist for a long period as blennorrhœa, and is accompanied by thickening of the coat of the vermicular process. After frequent exacerbations it passes into ulceration, which may, if the foreign body remains loose, attack the entire process, or if the former becomes fixed, affect only the point of attachment, or the end of the vermicular process. In the second case, the constant irritation at one spot, or the accumulation of ulcerative secretion and the consequent distension, induce a rapid development of the morbid process.

Under favorable circumstances, especially if the foreign body is discharged, the ulceration terminates, and the vermicular process partially or entirely shrivels up and forms a lead- or slate-coloured ligamentous appendix.

In the opposite case the ulceration, especially when gangrene is superinduced, more or less speedily brings on perforation of the vermicular process; this may occur at various points, sometimes at or near the termination, sometimes at the circumference, in such a manner as to cause a division into two parts. This perforation and the consequent discharge of the purulent contents into the peritoneal cavity, are not immediately followed by general peritonitis, inasmuch as the previous irritation has induced adhesions with the neighbouring peritoneal folds, which render the ultimate perforation innocuous for a time, as far as regards the remainder of the peritoneum. In the interior of the circumscribed cavity the ulcerative process in the mean while continues, the adhesions gradually give way, and general peritonitis ensues.

We further occasionally observe a metamorphosis of the vermicular process produced by obturation, which is analogous to dropsy of the efferent ducts of glands, and which is most apparent in the gall-bladder (hydrops cystidis felleæ). The foreign body sometimes attaches itself to a certain point and closes the canal without inducing ulceration; in consequence of an accumulation of the mucous secretion the vermicular process dilates, the mucous membrane thins and is gradually converted into a serous membrane which secretes an albuminous fluid. The vermicular process is thus metamorphosed into an hydropic capsule, which in the course of time, certainly may become the seat of inflammation resulting in ulceration and perforation.

Typhous and tuberculous affections frequently extend to the vermicular process, and both may be followed by perforation.

c. Diseases of the rectum.—The main defect of development to which the rectum is liable, is that represented by atresia ani, or congenital occlusion of the anus. In this case the rectum either has a blind termination, is absent, or opens into the urinary and genital passages (cloaca). In the first case the rectum may reach down to the point where the orifice should be, but the orifice is closed by an expansion of the common integuments over it; these are distended by an effort at defecation, and the meconium may even be seen through them. There may however be a greater deficiency of the rectum, the latter terminating at a higher point, or it may be totally absent, and its place be occupied by dense cellular tissue. In these cases the pelvis appears in an undeveloped state, especially in its antero-posterior diameter; it is very much inclined, and the external genital organs are placed very far back. This affords a valuable aid in the diagnosis, as it allows us to infer a considerable deficiency in the rectum.

Anomalies in the caliber of the rectum are both frequent and important, and appear in the form of dilatations or contractions. The former attain a very considerable extent, presenting sacculated sinuses, and an accumulation of indurated fæces; they are accompanied by considerable thickening of the coats and blennorrhœa. The latter vary much in form and distribution, but more still in respect of their causation. In the first place, the rectum is more liable than any other portion of intestine to be compressed by neighbouring viscera, by the pregnant uterus, by tumours developed in the uterine or vaginal parietes, by diseased ovaries, the retroverted uterus, the hypertrophied prostate, vesical calculi, pessaries, &c. The contractions dependent upon disease of the coats of the rectum are of still greater importance. To these belong contractions from hypertrophy of the coats, accompanied by an accumulation of fat, and induration of the surrounding cellular tissue; contraction consequent upon catarrhal inflammation and suppuration, or gonorrhœal ulcer, contraction resulting from a dysenteric cicatrix, polypous tumours, and various forms of cancer. Of these the strictures consequent upon dysentery and cancer are the most important.

Hypertrophy of the sphincter is a remarkable affection; it may in rare cases, especially in children, give rise to obstinate constipation and even to ileus but it frequently induces excoriation of the mucous membrane, the so-called fissure of the rectum.

We have already (p. 58) discussed prolapsus ani.

Catarrh and blennorrhœa, accompanied by hypertrophy of the coats, which frequently gives rise to plicated and polypous excrescences of the mucous membrane, are very frequent affections of the rectum. Gonorrhœal catarrh of the rectum represents a peculiar variety; it affects the same uniformly, or in a circumscribed spot: in the former case it is followed by a shrivelling of the rectum, and the mucous membrane gradually disappears; in the latter by a callous induration of the coats of the rectum, and not unfrequently by the formation of an ulcer, which as well as the stricture is placed in the vicinity of the sphincters, and is distinguished by its zonular form, its sinuous circumference and its callous puckered base.

The hemorrhoidal ulcer is peculiar to the rectum. It results from the irritation of the mucous membrane, produced by lasting congestion in inversion and prolapsus, strangulation by the sphincters, compression of the hemorrhoidal swellings, and undue medicinal interference. It is distinguished by its seat in the vicinity of the sphincters, its irregular shape, its indented and sinuous flabby margin of mucous membrane, and the similar ridges of mucous membrane that surround or pass over it. On account of the absence of reaction in the parts, corrosion of the vessels not unfrequently brings on violent hemorrhage.

An inflammation of cellular tissue resembling perityphlitis, occurs in the rectum, as periproctitis. The remarks made in reference to the former apply to the latter also (vide p. 104). It occasionally becomes chronic, and thus induces hypertrophy and callosity of the cellular and adipose tissues surrounding the rectum, which however differ from the analogous result of cancer. Like the hemorrhoidal ulcer, it may cause fistula recti.

Of intestinal cancerous affections, those occurring in the rectum are the most frequent, especially if we include the scirrhous degenerations which involve it by extension from the female sexual organs, but which we do not allude to at present.

Cancerous disease attacks the rectum in the various forms above described as affecting the intestine at large. The following however are particularly remarkable:

a. Erectile tumours developed in the tissue of the mucous membrane, and infiltrated with medullary carcinoma; they assume the shape of broad, sessile, or pediculated fungi. They are commonly placed at the commencement and posterior surface of the rectum, at about three or four inches from the orifice; we find these excrescences only in exceptional cases, at or close to the sphincters.

β. Annular carcinoma and stricture of the rectum.—It occurs almost exclusively at the upper portion of the rectum, and especially at the point at which the sigmoid flexure terminates in the rectum, and which, in its normal condition, presents a distinct contraction. The strictured part is either unattached or, as is more commonly the case, firmly agglutinated laterally to the promontory; notwithstanding its elevated position, it is, as Cruvielhier correctly remarks, pushed down by the feculent accumulations above, which generally precede the occurrence of ileus, it is therefore easily reached in exploring with the finger.

γ. Scirrhous degeneration of the rectum over a large surface, or throughout its entire extent.—This primarily affects the submucous cellular tissue, from which it extends through the entire muscular coat to the cellular sheath of the intestine, the cellular and adipose tissue of the pelvic cavity, to the posterior surface of the vagina, and even to the uterus; or it originally attacks one of the last-named tissues, and involves the rectum secondarily. The rectum is firmly attached, from being agglutinated in its entire extent to the sacrum, or adherent to the vagina, or it appears wedged into the pelvis by the surrounding morbid growth; its caliber may be variously diminished, though it sometimes is unaltered; its internal surface is uneven, nodulated, and hard, or it is filled with soft, fungous, bleeding growths; the anus, especially if the morbid product extends to the sphincters, is patent, everted and varicose; even the perineum appears more or less swollen, protruded, and hardened; and this induration extends to a considerable extent over the nates in consequence of the condensation of the subcutaneous adipose tissue.

The foreign bodies found in the rectum may either have reached it from above, but not proving injurious until they reach this point, or they may have been introduced, per anum, in consequence of morbid sensations or perverted sexual desire. In the latter case they are commonly very singular objects and of alarming size.

§ 6. *Anomalies of the Intestinal Contents.*—1. Excessive accumulation of gas is very frequently caused by an increase in the secretion on the internal surface of the intestine, accompanied by an impediment to its escape. This occurs over a large extent of intestine in morbid affections of the mucous membrane, and especially in the exudative processes, such as typhus, in the shape of tympanitis; the escape of the gas is impeded by the paralysed state of the muscular coat. This condition also accompanies anomalous states of other intestinal secretions, especially of the intestinal mucus, or morbid affections of the nervous, especially the ganglionic, system; in the latter instance, however, there is frequently no increase in the amount of gas secreted, but in consequence of the atony of one portion of intestine, and spasmodic contraction of the remainder or of atony of the entire tube, it accumulates, and is retained in the shape of tympanitis throughout the canal.

Occasionally, an excessive accumulation of gas is brought on by the consumption of certain flatulent articles of diet in a debilitated state of digestion, or where there is an absence of the due amount of bile.

2. The intestinal mucus is very often found in excess, and occasionally the amount secreted is insufficient: in the former case, it also undergoes considerable modifications as to quality. The increase of secretion either exists throughout the intestinal canal, or affects certain sections in the shape of chronic catarrh or blennorrhœa; the mucus is either milky, white, yellowish and purulent, or glutinous, transparent, vitreous, spawny. In the congestive state of typhous and typhoid diseases, we find a peculiar gelatinous mucus on the intestinal mucous membrane, and more especially on that of the small intestine and cæcum.

A diminution in the quantity of mucus accompanies excessive formation of bile and of feculent matter (copropoësis).

3. There can be no doubt that a peculiar gelatinous constitution of the mucus is the nidus of intestinal entozoa, and the

cause of helminthiasis. There are two orders of worms, the nematoidea and the cestoidea: to the former belong the ascaris lumbricoides, the trichocephalus dispar and the oxyuris vermicularis; to the latter, the tænia solium and the botryocephalus dispar.

The lumbricus occurs in the small intestine of children and young persons, and is sometimes found in large numbers, forming knotted accumulations. It often ascends to the stomach, into the œsophagus and pharynx, it may even pass from here into the larynx, and thus, as has been distinctly observed, produce suffocation. Occasionally, several lumbrici may be found undertaking such and similar preposterous peregrinations at the same time.

The trichocephalus dispar inhabits the cæcum and the adjoining portion of the small intestine. Its occurrence in the gelatinous, feculent contents of these parts in typhus, is very important.

The oxyuris (ascaris) vermicularis inhabits the rectum.

The tænia is found, one or more in number, in the small intestine.

We may still be permitted to doubt the fact that the entozoa ever perforate the intestine, at all events it is a very rare occurrence. It is well established however, nor is it of very unusual occurrence, and this applies especially to the lumbricus, that they pass through orifices in the intestinal parietes into the abdominal cavity, into abscesses, into the bladder or the vagina.

4. The fæcal matters offer various important points for consideration.

They sometimes accumulate in the intestine to an extraordinary degree, in consequence of repletion, torpor of the intestine, diminution of the intestinal secretion, increase of the absorbent powers of the intestine, and induration of the fæces. These accumulations occasionally affect single portions of the intestine, and may, if persistent, induce disease of the coats.

The occurrence of an excessive elimination of fæces (copropoësis excedens) from the intestinal secretions, is an established fact. It takes place as a critical discharge in various diseases, and especially in those that are accompanied by increased secretion in the intestinal canal; but recent observations have demonstrated its occurrence as an idiopathic disease, which may, by the excessive drain it causes, give rise to atrophy of the intestinal coats and to general emaciation. The colour of the fæces mainly depends upon the colour and degree of saturation of the bile. They may be dark-brown, dark-green, black, pitchy, or, in the absence of bile, grayish or clayey. Occasionally the fæcal discharge is brown internally, and invested by a white clayey covering, of varying thickness.

The consistency of the fæces varies considerably: they are liquid when the serous exhalation of the mucous membrane is excessive; semifluid when the secretion is muco-gelatinous; or they are mixed, with the secretion in the shape of floculent grumous particles. The feculent matter found above the various intestinal strictures presents a peculiar frothy appearance.

The fæces may have hardened, so as to present lumps or scybala of various sizes. This scybalous induration generally takes place in the sigmoid flexure and the rectum, though it occasionally reaches up to the cæcal valve. If accompanied by flatulency, small portions of feculent matter are found to adhere to the intestine, and after the mucus by which they were made to adhere has dried up, they appear agglutinated to, and even imbedded in, the internal surface of the intestine.

Figured fæces either form cylinders, which may be variously affected by pressure of the intestine or by stricture, or they form tubers of various size. This leads us to a consideration of fæcal concretions and intestinal calculus.

5. Intestinal concretions are either formed in the intestine, or after being formed external to it, reach it by the natural or by abnormal passages.

To the former belong indurated scybala, which may be produced under all the circumstances that give rise to a retention of fæces; and especially the tuberculated fæcal concretions that form in and adhere to the cavity of colonic diverticula. They may be various foreign bodies, such as fruit-stones, indigestible portions of vegetables or pieces of bone, which have been introduced into the intestine, and become incrusted with fæcal matter. Or such bodies, especially when occupying a blennorrhoic portion of intestine, as the vermicular process or cæcum, give rise to deposits of grayish fatty matters, chalky and saline substances.

To the latter belong biliary calculi, which have reached the intestine by the natural passages, or by ulcerative communication; and the fatty and chalky concretions which have formed in abscesses adjoining the intestine and have passed into the latter.

Intestinal concretions prove injurious to the intestine, in proportion to their size and form, as we shall have occasion to explain further on.

With regard to serous, muco-serous, albuminous, puriform, and purulent discharges, to fibrinous coagula, and pseudo-membranous formations in the intestine, we refer to the remarks given under these heads.

6. Blood is found in large or small quantities, coagulated and fluid, red or variously discoloured, in the vicinity of the point at which it was discharged, or extended over a large surface. Hemorrhage occurs in consequence—

Firstly; Of active, passive, and especially of mechanical hyperæmia; the latter being a frequent result of obstacles in the portal system. The mucous membrane presents no essential textural alterations, but is either congested and suffused, or in consequence of the excessive hemorrhage, pale and anæmic. The source of hemorrhage is scarcely discoverable. We have lately seen two remarkable cases of this description, in which exhausting hemorrhage resulted from intense and extensive burns of the abdomen.

Secondly; In consequence of the various exudative processes accompanied by solution of the mucous tissue and its vessels, e. g. in dysentery.

Thirdly; The hemorrhage may be caused by other morbid degenerations of the mucous tissue, e. g. erectile fungoid excrescences, the typhous deposit at the period of metamorphosis, or torpid ulcers.

Fourthly; In rare cases the hemorrhage results from the rupture of a varicose vein in the submucous tissue of the intestine, the investing mucous membrane giving way at the same time. It is more frequently caused by corrosion of an artery or vein at the base of an hemorrhoidal ulcer of the rectum.

Every variety of hemorrhage, but especially the one first cited, is favoured by diminished density of the blood.

When the blood is found extravasated over a large surface, it may have come from above, but it frequently happens that the source of the hemorrhage is below the extravasation; this is particularly the case in hemorrhage of the rectum.

Moreover, the blood may have reached the intestine from the stomach, the œsophagus, the hepatic viscera, and even from the respiratory organs.

The longer the blood remains in the intestine, the longer it has been exposed to the operation of the intestinal secretions, the more it becomes discoloured, assuming a chocolate or black tinge; and when it has experienced the influence of the gastric juice, it is frequently converted into a pitchy or tarry mass. Bile in a very concentrated form often presents a similar appearance.

The intestine sometimes offers a passage by which acephalocysts of the liver (the so-called hydatids) are discharged.

7. We must lastly investigate the foreign bodies found in the intestine.

To this class belong concretions formed within the body, and especially in the biliary ducts, and substances that have been introduced by mouth or per anum. They prove injurious by producing lesions of the intestinal parietes, as in the case of rough or pointed bodies, bones, or fragments of bone, portions of stone, glass, needles, &c. After attaching themselves to the mucous membrane, suppuration is established, and they may thus escape through the intestinal and abdominal parietes; or the perforation may communicate with another portion of intestine, or with a neighbouring hollow organ, and the escape be affected through the urinary and genital organs. The foreign bodies may also block up the intestine and induce ileus; these cases are of extreme importance, and they admit of the following subdivision:

Firstly, The foreign body is arrested at a certain point of the intestine, in consequence of its rough and angular form.

Secondly, The foreign body is retained simply from a disproportion between the caliber of the intestine and the size of the substance, and occlusion is the result.

Thirdly, The foreign bodies accumulate to a considerable number at one point, and the consequent extreme dilatation and paralysis of the intestine induce obstruction.

Rough, angular bodies, if not very large, frequently pass through the intestine without difficulty, in an envelope of mucous and feculent matter; but they often become attached to the intestine, by inserting their edges and processes into it, and may, by the consequent inflammatory swelling, give rise to an obliteration of the passage.

Large round or oval bodies, with a smooth surface, may be retained at various points of the small intestine, but especially at the terminal portion of the ileus, which presents a distinct diminution in caliber.

We class among these foreign bodies large biliary calculi, which have escaped from the bile-ducts into the intestine.

Indigestible substances that have been taken in large quantities, especially the peel of fruit, cherry and plum stones, often accumulate at particular points of the colon, as the cæcum or the sigmoid flexure. They give rise to uniform or lateral dilatation of the intestine, accompanied by atony and paralysis of the latter. This condition may, sooner or later, in a ratio with the size of the accumulated mass, give rise to ileus; or if the accumulation is inconsiderable, and the action of the superior portion of the intestine capable of effecting a partial discharge, it may last a considerable time, and end in a cure; or it results in chronic inflammation, the formation of sinuses, and the ultimate contraction of the intestine, which again may give rise to occlusion.

Appendix.—On spontaneous Ileus.

We distinguish between so-called organic ileus, into the nature of which we have inquired in preceding paragraphs, and dynamic or spontaneous ileus. The latter deserves a careful investigation of its cadaveric relations, the more so as a sound theory of its nature, based upon practical experience, is very much wanted.

Ileus is a rare occurrence, and undoubtedly often dependent upon atony of an intestinal segment, which must be viewed as the proximate cause, in contradistinction to the case just examined, in which the accumulation of foreign matter is the primary affection. It takes its origin in a sedentary mode of life, in depressing physical conditions, repletion, superstimulation by purgatives and injections, rheumatic affection of the intestine, diseases of the spinal cord, and even of the brain. The colon is the part almost invariably affected. Stagnation and accumulation of the fæces in the affected portion of intestine follow, dilatation is induced, and the atony ends in paralysis; when this happens, ileus is at hand. Its actual occurrence however, as well as the improvement and cure of the affection, depend upon the state of innervation in the upper healthy portions of intestine. If the action of these portions suffices to propel the fæces through the dilated segment, and thus from time to time to empty it, the latter may resume its functions, and thus return to a healthy condition. If, however, the upper portion of the intestine does not possess sufficient power, which will be the case if the accumulation be excessive, or the paralysed segment has sunk to a lower region of the abdomen, the accumulation will proceed, and at last reach up to the healthy intestine. Here the peristaltic action is reversed, the fæces are thrown back into the stomach, and are expelled from there by vomiting.

When the paralysis has reached a certain point, inflammation and sloughing set in, and enteritis peritonealis results. As this induces paralysis of the muscular coat and passive dilatation in the upper portion of the intestine, a change occurs in the ileus, inasmuch as the point at which it commences advances with the advance of the inflammation.

All pathologists of distinction deny the possibility of spasmodic contraction or spasmodic stricture in a portion of the intestine, being the cause of obstinate constipation or of ileus. The *modus operandi* of the various remedial agents employed fully confirms the theory given with regard to this simple form of ileus. The benefit derived from purgatives is to be explained by the force with which the healthy intestine propels the fæces downwards, and the rapidity with which they pass through the distended portion; the advantage of opiates consists in diminishing the activity of the healthy portion, and the consequent accumulation in the dilated part, and in allowing the latter time to recover its activity.

It is highly probable that the use of narcotic enemata of tobacco or belladonna, effects an evacuation of the dilated portion, by inducing a complete relaxation in the inferior portion of intestine, which is thus enabled to admit and convey onwards the accumulated fæces. If the injected fluid can be propelled as far as the diseased part, the discharge of the fæces is aided by the mechanical distension of the intestine, and is undoubtedly further promoted by the change of position which the injection effects in the healthy intestine. It follows that injections of fluids that exert no remedial influence, such as air, may effect an evacuation, and thus establish the first condition of a cure.

CHAPTER II.

ABNORMITIES OF THE ACCESSORY ORGANS OF THE ALIMENTARY CANAL.

SECT. I.—ABNORMITIES OF THE LIVER.

The diseases of the liver have continued to remain to the present day a subject of extreme difficulty, in spite of the progress made in the anatomy of this viscus. As one of the chief organs concerned in sanguification, it affects, as might indeed have been inferred *a priori*, the somatic and psychical character of the individual in the most varied and extensive manner within the range of physiological bounds; and on the other hand, many of its morbid affections, which are beyond the reach of the scalpel, become intelligible only by attending to the anomalies presented in other organs. It is to be hoped that future inquiries may elucidate them more fully by showing the influence these anomalies have upon the constitution of the blood, and by explaining the various spontaneous derangements of the vital fluid.

§ 1. *Arrest and Excess of Development.*—The liver is absent in very imperfect monstrosities, especially in acephalous monsters, in which the heart, the lungs, and the greater part of the intestinal canal are also deficient; in biventral monsters the liver presents more or less marked traces of duplication.

§ 2. *On the Irregularities of Volume generally, and on Hypertrophy and Atrophy in particular.*—We find the liver either abnormally enlarged or abnormally diminished in size. The former defect, in which the left lobe remains permanently enlarged, so as to extend to the left hypochondrium and beyond the spleen, is occasionally congenital. Both conditions, when acquired, become extremely interesting in a diagnostic point of view.

Increase in the volume and weight of the liver depends upon—

Firstly, Hyperæmia, congestive turgor;

Secondly, Inflammation, inflammatory swelling;

Thirdly, Congestion and stasis in the capillary gall-vessels;

Fourthly, True uniform hypertrophy;

Fifthly, Excessive, but morbid, nutrition, i. e. the deposition or infiltration of a substance foreign to the hepatic tissue in quantity or quality—conditions which have hitherto been considered as hypertrophy of one of the component parts of the organ;

Sixthly, Adventitious products, which directly increase the weight and volume of the liver in proportion to their own number and size, and indirectly contribute to that effect by the congestion they give rise to in the surrounding tissue.

Diminution in the volume of the liver is the result of atrophy and alteration in the tissue.

a. Hypertrophy.—Under this head we consider not only the abnormal condition dependent upon exalted nutrition and increased deposition of the peculiar normal constituents of the organ, but those anomalies also in which the increase of size is the result of excessive deposition of separate elements of those constituents, and of the deposition of heterogeneous matter. The former is genuine hypertrophy; the latter, which are often mistermed hypertrophy, includes the nutmeg liver, the fatty liver and its variety the waxy liver; and lastly, the infiltration of an albuminous, lardaceous, and gelatinous substance.

Although the last-named abnormal conditions are closely connected with deep-seated constitutional and acquired derangement in the vegetative sphere, it is of practical utility to consider them in this section until we shall have arrived at an accurate knowledge of the infiltrated abnormal matter, and of the corresponding anomalies in the vegetative system at large. We are the more justified in adopting this course as the enlargement of the viscus, and especially the peculiar features in its growth which are perceptible to external examination, afford a valuable aid in the recognition of these internal conditions.

a. Pure hypertrophy, i. e. a simple increase of the normal specific tissue, can scarcely occur without uniform hypertrophy of all the constituents of the liver. It is not unfrequent; it is a result of hyperæmia, and presents the following anatomical signs: the liver is increased in volume, but retains its usual shape; it is hard, lacerable and full of blood; the acini appear enlarged, and of the normal reddish-brown colour. This coarse-grained texture must be carefully distinguished from so-called granular liver.

β. The nutmeg liver.—That condition of the liver in which a separation of the yellow and reddish-brown substances takes place, especially if the former predominates, and which presents a close resemblance to the section of a nutmeg, has been termed the nutmeg liver; it is commonly considered as an hypertrophy of the so-called white or secreting portion, the red portion either remaining unaltered or being more or less condensed by the former.

According to our own researches the nutmeg liver occurs under two different conditions, and there are consequently two varieties.

aa. In one case it appears as an enlargement of the capillaries of the biliary canaliculi, accompanied probably by hypertrophy of the latter (the secreting substance), and resulting from excessive secretion of bile and stasis of the secretion. The two substances are the more defined, the darker the colour of the bile and of the red substance.

ββ. In the other case it is due to an increased deposit of the fat normally due to the liver.

In either case we trace several degrees:

Firstly, In the lowest degree the normal distinction between the two substances is simply more marked, the white substance appearing more developed;

Secondly, In the second degree the predominance of the white substance becomes more apparent, and forms circumvolutions that envelope the red substance;

Thirdly, In the highest degree the organ approaches, in the first variety, to the granular; in the second, to the fatty liver.

The liver appears, in the second variety, to be slightly enlarged, at least it is never diminished in size; in the advanced stages it has a tendency to become flattened, and to expand whilst its edges are thickened.

Mechanical hyperæmia of the portal system from disease of the heart is peculiarly liable to encourage the development of the nutmeg liver. The affection occurs very frequently; it may present no symptoms whatever, or be accompanied by distinct signs of hepatic disease, though not such as to indicate the specific derangement. In the form in which it presents the early stage of the fatty liver, it most probably gives rise to the numerous complaints which are relieved by neutral salts, alkalies, mineral waters containing these substances, saponaceous compounds, and the so-called resolvent vegetable extracts.

γ. Fatty liver, the adipose metamorphosis, morbid accumulation of fat in the liver.—A well-marked case is distinguished by the following anatomical characters: the liver is enlarged, the increase of size taking place chiefly in a lateral direction; its edges are flattened and swollen, the peritoneal covering is smooth, shining, transparent and tense; the organ is soft and pits on pressure; its colour, internally and externally, is uniformly yellowish-red or light yellow, resembling that of autumnal foliage; it is pale and exsanguine, and contains a large amount of fat, as evidenced by the greasy deposit when cut with a dry warm blade, or as proved by submitting the liver to high temperatures.

The disease consists in a deposition of free adipose tissue to such an extent as not only to replace the true glandular structure, but to penetrate the entire parenchyma to the exclusion of the vascular tissue.

In the earlier stages of the affection the various signs alluded to are less marked.

Two conditions chiefly favour its production:

In the first instance it very commonly accompanies tubercular phthisis; and, according to the researches of Louis, is found in two thirds of all cases of phthisis. Andral has explained this occurrence on the ground of impeded secretion of hydrogen by the lungs; but extended investigation allows us to conclude that this impediment, which is not even demonstrable, is not the cause of the deposit; but that it is an essential constituent or pathognomonic combination of the tubercular dyscrasia, inasmuch as it allies itself with tubercular affections of every kind, with tubercle of the intestinal mucous membrane, of the bronchial glands, the serous membrane, the bones, &c.

Secondly; The fatty liver is also developed—independently of tubercle—in consequence of a luxurious and indolent regimen, in children that have been gorged with food, and especially as a result of dram-drinking. In this case it is accompanied by accumulations of fat in the omentum, the mesenteries, the pericardium, the heart, and the subcutaneous cellular tissue, by fatty degeneration of the muscular fibres of the gall-bladder, and even of the muscular tissue of the heart; the common integument has a leaden hue, and the perspiration has a greasy appearance and a peculiar odour. The fat bears throughout a resemblance to tallow.

The waxy liver is a variety of the fatty liver; it is distinguished from the latter by a colour resembling that of beeswax, by its greater consistence, dryness, and brittleness; and these qualities depend upon a peculiar modification of the infiltrated fat, which, although accumulated to a considerable amount, leaves but few traces on the scalpel.

Occasionally the tallow is seen deposited at a few points only, or it accumulates at particular spots. They are commonly superficial, though they are also seen in the deeper parts in the shape of irregularly-circumscribed maculæ, which are the more conspicuous by their change of colour the less the other portions of the liver are involved in the disease, and the darker they are.

δ. Lardaceous (speckig, baconny) liver.—Next in order to the fatty liver are the infiltrations of the hepatic parenchyma by a coarser, gray, sometimes transparent, albuminous, lardaceous, or lardaceo-gelatinous, substance. This affection is found concurrent with constitutional disease of the vegetative system, especially with scrofulous and rickety disease, with syphilitic and mercurial cachexia, and it may consequently be congenital. It appears that it is occasionally developed as a sequela of intermittent fever in cachectic subjects.

The following are its anatomical characters: considerable increase of size and weight, with remarkable lateral development and flattening of the organ; smoothness and tenseness of the peritoneal investment, a certain degree of doughy consistency combined with hardness and elasticity, anæmia, pale, watery, portal blood; gray, grayish-white, or grayish-red colour, tinged with yellow or brown; the surface of a section being smooth, and homogeneous, resembling bacon, and leaving but a slight fatty stain on the scalpel. Sometimes, however, there is an adipose deposit in the entire liver, or in certain parts of the organ, and the blade of the scalpel then shows the fatty appearance when a section is made.

In many cases the foreign substance is also deposited in the shape of white lardaceous spots, the edges of which are not distinctly circumscribed.

The spleen is very commonly affected in a corresponding manner; it is found much enlarged, and infiltrated by a similar substance (vide Spleen). Bright's disease of the kidneys and analogous renal affections are also very often complicated with the lardaceous and fatty liver.

b. Atrophy.—Atrophy of the liver, independent of the *marasmus senilis* of the organ, appears in various forms. We first draw attention to two distinct forms which have not been remarked hitherto, and which, similarly to the hypertrophic affections, are the expressions of a constitutional malady, and have their immediate origin in anomalies of the blood. Owing to their distinctive colouring, they may be appropriately termed yellow and red atrophy.

a. Yellow atrophy.—This affection is characterised by the saturated yellow colour, owing to a diffusion of bile throughout the tissue, by extreme flabbiness and pulpiness, loss of the granular texture, extreme rapidity in the reduction of size, which chiefly affects the vertical diameter, and consequently induces a flattening of the liver. It occurs chiefly in the early years of life, during puberty, and in the prime; it is remarkable for the rapid course it runs, for extreme tenderness of the liver, nervous attacks, and jaundice; it terminates fatally with febrile symptoms of a disorganized state of the blood, irritation of the brain and its membranes, and hydrocephalic softening of the former, and with symptoms of exudation and suppuration generally, and especially of the mucous membrane, pneumonia, &c.

The blood contained in the large vessels of the liver, and even that contained in the trunk of the vena portæ, is reduced in consistence, and of a dirty reddish-brown colour; and the coats of the latter vessel are tinged with bile. This points to the fact that the portal blood itself contains such an excess of biliary constituents, that they are separated here, and still more in the capillaries, and thus fill the entire vascular and biliary system; the coats of the vessels and their cellular strata thus absorb bile by exosmosis, the true glandular tissue fuses, is lost in the biliary colliquation and disappears. The immediate consequences of this condition are that the blood in the vena cava is infected and overcharged with bile, causing intense jaundice; when this has reached a certain point, the above symptoms terminate in a rapid consumption of the blood and in exhaustion. We commonly find biliary matter of a deep yellow colour, or if the disorganized blood has exuded through the mucous membrane, a black tarry substance in the intestine.

β. Red atrophy.—This is distinguished from the former by its dark-brown or bluish-red colour; the liver is gorged with blood, and presents a spongy, elastic consistency; there is an absence of granulation, and a section offers an appearance of perfectly homogeneous texture; the organ is reduced in size, though its thickness preponderates over the other dimensions.

The disease is chronic, and is always accompanied by torpor of the abdominal ganglia, venous plethora of the abdominal viscera, and by the formation of brownish-black, or greenish-black, tarry bile, and fæces of a similar constitution. By itself it rarely proves fatal, though death may ensue from the marasmus brought on by the enduring congestion of the portal system. In addition to these two forms, we consider—

γ. Laennec's cirrhosis in its advanced stage, a chronic affection which resembles acute yellow atrophy, but besides being chronic, is distinguished from the latter by the liver being firm, or, if flabby, very tough.

Granular liver is a variety of this species; it appears essentially as secondary textural degeneration, and although commonly treated of as atrophy, and from ignorance of the above described forms as the only variety of atrophy, we refer for a minute examination to a subsequent portion of this work. Finally, we have—

δ. Atrophy of the liver from obliteration of the ramifications of the vena porta (vide, the acquired Lobular Form of the Liver, p. 126).

§ 3. *Abnormities of Form.*[1]—These abnormities are either congenital, and are then in part fœtal conditions of the liver, in part acquired. To the former belong the round, the unlobulated, or but slightly lobulated (embryonic) liver, the semiglobular, the broad, the flattened, the triangular and quadrangular, and multilobular liver.

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[1] Oestr. Jahrb., xx, 4.

The acquired irregularity of form is either the result of external influences, or it depends upon an affection of the tissue of the liver. The former consists in a flattening of the liver anteriorly, in indentations or furrows, produced by contractions or deformities of the thorax, by stays, exudations, enlarged viscera or morbid growths. The latter are of peculiar interest, as the nature of the hepatic malformation taken in connexion with the increase or diminution of size, is characteristic of the internal affection of the viscus. We shall devote some further consideration to this class.

Malformations of the liver must be considered in reference:

Firstly, To the relation of the vertical to the longitudinal and transverse diameters, or the circumference of the edges;

Secondly, To the condition of the edges, which may be bevelled off, thinned, acuminated, or thickened, enlarged, and rounded;

Thirdly, To the state of the surface, which may be variously smooth and level, or as variously uneven.

With reference to the first variety, we are able to affirm that the development of the vascular tissue generally, is connected with swelling and enlargement of the liver and with a preponderance of the vertical diameter (thickness); that the so-called development of the yellow tissue (infiltration) is complicated with lateral enlargement, or increase of size with flattening, and corresponding diminution of the vertical diameter.

In reference to the edges, we have to remark that in the last-named states, at least in their advanced degrees, they are absolutely thickened and rounded.

We find the following irregularities of form to occur more particularly in connexion with the above-mentioned varieties of enlargement.

1st. When the increase of size is the result of congestion, or of temporary hyperæmic turgor, the liver retains the general outline of its normal condition; but if this affection becomes permanent, the vertical diameter soon predominates considerably. This is still more the case in genuine hypertrophy.

2d. The nutmeg liver, the fatty and waxy and lardaceous liver, induce a lateral enlargement of the organ; the vertical diameter diminishes, and the liver is flattened: this becomes more apparent when, as in the higher degrees, there is at the same time, an increase in the substance of the edges, i. e. when the latter become thicker and globose.

An evident exception occurs when this condition takes place in early life, or when it is congenital. The above-mentioned irregularity of form is in that case less marked, as the preponderance of the vertical diameter of the liver is normal in the fœtal state and during the first years of life.

Even in the varieties of atrophy of the liver, the remarks made as to the alterations of form, are confirmed in the main; in the yellow variety the liver is generally reduced in its vertical diameter, whereas in the red variety, the decrease is chiefly perceptible at the edges, and the vertical diameter consequently predominates; in the former case the organ presents a disc-like shape, in the latter that of an hemisphere or ball.

The irregularity of form consequent upon that textural disease which is called the granular liver, is very remarkable. It is almost always accompanied by a considerable diminution of size; the granulations and the atrophy generally commence at the edges, and the latter attains its extreme development at this point; the edges consequently appear very much thinned, and at last form a mere seam, consisting of cellulo-fibrous tissue, which is contained between two condensed laminæ of peritoneum, and reflected over the convexity, or inverted into the concavity of the liver. The left lobe of the liver is frequently shrunk into a very small, flattened, cellulo-fibrous appendix, and the thick hemispherical or globular mass of the right lobe represents the entire organ.

Occasional exceptions arise from the granular disease being developed in a liver that was previously affected by some other disease, as by the fatty degeneration; in this case the reduction in size only takes place very slowly, and the edges instead of being thinned down, are often thickened and rounded.

The more violent inflammations of the hepatic peritoneal lamina, affect the surface layer of the liver, and thus induce changes in form, that vary in proportion to the intensity of the inflammation. Thus the liver is not unfrequently converted into a thick cake with rounded edges, if the inflammation has been uniform, or it may be converted into a globular mass, compressed into a small space by peritoneal investment, which, in consequence of repeated attacks of inflammation, is transformed into a fibro-cartilaginous tissue. A malformation which we shall have occasion to revert to subsequently (superficial lobulation) results from an intense development of this process in detached spots.

The surface of the liver offers several points for consideration.

Hyperæmic turgor, and still more all the varieties of hepatic infiltration, are distinguished by their producing a smooth surface.

Unevenness of the surface is produced in various forms and degrees ; the chief forms are the racemose and the lobulated.

The racemose form appertains to the granular liver ; it depends upon the granulation of the peripheral layer, and appears delicately or coarsely moulded, of partial or uniform occurrence, in proportion to the development of the acini.

The lobulated liver is either a congenital abnormity or an acquired malformation.

The congenital form of this affection is owing to an arrest of development ; the liver is divided into several lobes, and this division may proceed so far as to present several small livers which are only connected with the main organ, by peritoneal folds and the vessels inclosed in them. This condition is not accompanied by any perceptible shrivelling or condensation of the peritoneum in the fissures or sulci, and still less by a condensation of the parenchymatous cellular tissue, or an obliterated state of the vessels. We may assume *à priori*, and experience confirms the view, that the lobulation commences and is chiefly, if not exclusively, developed on the concave surface of the liver, as the natural point of departure for the fissures.

Acquired lobulation of the liver presents itself in various degrees, and depends upon various causes. We base our division upon the latter, and thus arrive at their chief varieties, which, at the same time, represent as many degrees.

Very superficial lobulation, one of which there is a mere indication, is occasionally the result of superficial inflammations affecting the hepatic sheath. These induce fibrous condensation of the parenchymatous cellular tissue, and cicatriform contraction of the investing peritoneum, beyond which the neighbouring parenchyma projects in the shape of shallow, convex, and smooth protuberances, circumscribed by slight furrows.

A second form, in which the lobulation is more marked, is developed in the granular liver. In the same manner as the granulations may produce a racemose appearance of the hepatic surface, they may, when several of them are grouped together, produce larger protuberances, or lobes; if the interstitial cellular tissue is much condensed, the peripheral groups may become pediculated so as to resemble mere appendices.

The third form and highest degree, which bears most resemblance to congenital lobulation, results from the obliteration of one or more branches of the vena portæ, from inflammation and the consequent shrivelling and atrophy of the hepatic sections supplied by their ramifications. These sections shrink in the direction of the obliterated trunk, the peritoneum generally follows, the surface is affected, and fissures result, which run in various directions, and above which the healthy tissue projects in the shape of large rounded protuberances. The enlargement of these protuberances appears to be encouraged by the additional labour thrown upon them, and still more so if these portions have become the seat of fatty and other infiltrations.

Irregularities of the hepatic surface of a different kind are induced by the development of adventitious products, such as cancer in the liver; but these will be discussed hereafter.

§ 4. *Abnormities of Position.*—Abnormities of position are either congenital or acquired. To the former belong the abnormal position of the liver, external and internal to the abdominal cavity; as in cases of fissure of the abdominal parietes and eventration, of deficient diaphragm, of congenital umbilical hernia, of lateral transposition of the viscera. In the latter case, the entire relations of the organs have undergone a corresponding change, the large right lobe now being on the left side, and *vice versa,* and the vesical fossa to the left of the umbilical fissure.

Some of the acquired malpositions of the liver resemble the former, as in the case of extensive wounds of the abdominal parietes, and of the diaphragm, and of certain rare anomalies, resulting from acquired umbilical hernia. A more common occurrence is the abnormal position of the liver within the abdominal cavity, in consequence either of pressure exerted by other viscera, or of a change in the size and weight of the organ. We find the liver and the neighbouring organs pushed out of their proper place by distortions of the spine; by hypertrophied neighbouring viscera, e. g. the right kidney, by expansions of adjoining cavities, as of the pericardium, but more especially of the right pleura. In the latter case it is forced down into the mesogastric region by the diaphragm which is depressed by the accumulation of gases or fluids in the pleura; and as the pressure especially affects the right lobe, this portion occupies the lowest position, and comes to be placed under the left lobe. The liver may be pushed upwards into the concavity of the diaphragm and into the thorax, by gaseous accumulations in the abdominal cavity, by ascites, by peritoneal effusion, and by tympanitic distension of the intestines. It is as variously affected by partial exudations and by morbid growths, and the change of position corresponds to their seat and magnitude.

The spontaneous change of position which the liver undergoes in consequence of increase in size and weight, is invariably a descent to a lower region of the abdomen, and it follows from the anatomical relations of the parts that it must be the right lobe which is peculiarly involved.

§ 5. *Changes of Consistency.*—As these changes are always allied to other anomalies of more importance, and have therefore been already alluded to, or will be subsequently considered, we here only advert to the diminution in the consistency of the organ which takes place without any change in the hepatic tissue, in all dyscrasic processes accompanied by decomposition or subsequent to excessive elimination of the fibrine of the blood, as occurring in typhus and typhoid states, in purulent infection of the blood, and acute tuberculoses, or subsequent to extensive exudation on serous membranes, and especially in puerperal fever. The liver appears flabby, collapsed and pultaceous; its parenchyma is softened and infiltrated with serum, generally very pale and exsanguine, or containing only pale, thin, and watery blood.

§ 6. *Diseases of the Tissues. a. Hyperæmia, apoplexy, anæmia of the liver.*—Hyperæmia of the liver appears in three forms; as active hyperæmia, resulting from idiopathic or consensual irritation; as passive hyperæmia, dependent upon torpor in the portal vascular system; and lastly, as mechanical hyperæmia, chiefly induced by obstacles in the circulation through the heart and lungs; the last form is one of very frequent occurrence, and is marked by the intensity and extent to which it affects the entire viscera. In rare cases an anomalous anastomosis of the epigastric cutaneous veins with the umbilical veins which have remained permanently open, gives rise to persistent hyperæmia of the liver. (Vide Veins.)

The anatomical signs are congestive turgor of the viscus, increase of size, especially in the vertical diameter, but without any further change of form, dark-red colour, and obliteration of the yellow substance, softening of the parenchyma, and a large supply of blood. In habitual, and particularly in permanent mechanical hyperæmia, the vessels in the liver, as well as the trunk of the vena portæ, and the branches from which it arises are found dilated and varicose.

Habitual hyperæmia of the liver is apt to be followed by hypertrophy; and as a consequence of an increased production of portal blood, and an exaggeration of its peculiar qualities, the nutmeg liver may result, which again, may give rise to granular degeneration of the organ.

Apoplexy of the liver is a very rare occurrence; it results from congestion which has rapidly attained a very high degree, and undoubtedly commences as capillary hemorrhage; an apoplectic spot is thus caused, which may enlarge and induce a rupture of larger vessels. According to the seat of the hemorrhage we find two varieties, viz. peripheral or deep-seated hemorrhage; both may however occur simultaneously. In the former, the hepatic peritoneum, especially that investing the convex surface of the right lobe, is detached in a varying extent and underneath it is found fluid or coagulated blood to a larger or smaller amount. These hemorrhages occur chiefly in infants, as a consequence of impeded respiration and pulmonary circulation, from suffocative catarrh. The hepatic peritoneum may become ruptured, and thus cause an effusion of blood into the abdominal cavity. The liver is in a state of permanent congestive tumefaction, and being overcharged with blood, presents a dark-red colour, and looseness of texture. We are reminded by these effusions of the analogous bleedings at the cranium, accompanied by a detachment of either the pericranium or the dura mater, which constitute the so-called thrombus or cephalhæmatoma.

In the second variety, apoplectic spots of various forms and sizes are found in the parenchyma; there are generally several of them dispersed through the organ. This variety is found more frequently in adults than the former, but the two may take place at the same time. If a cure follows, a cellulo-fibrous callous cicatrix remains.

Anæmia of the liver is the result of hemorrhages, exhaustion, or a reduction of the mass of blood by extensive exudative processes, and is accompanied by a diminution of the consistency of the liver. It is also constantly associated with many hepatic diseases, such as the fatty, the lardaceous, and waxy liver, to which we have already adverted.

b. Inflammation of the liver (*Hepatitis*).—Although inflammation of the liver may not be a very rare affection, it is certain that the intense degrees, which terminate in suppuration and abscess, do not occur very frequently with us. We may remark that the most various diseases of the hepatic tissues are at the bedside taken for hepatitis.

If we sum up the observations of solitary instances of well-marked hepatitis, taken in connexion with the condition of the hepatic tissue surrounding wounds and recent abscesses of the liver, we find the following to be the anatomical signs of hepatitis previous to its termination in suppuration:

Inflammation never attacks the entire organ, but occurs in one or more patches. Commonly there is but one spot, but it may vary in extent, and the process is here found developed in various degrees. The viscus is swollen in proportion to the number and size of the inflammatory patches, and this tumefaction is particularly perceptible when a section is made, the turgid tissue rising above the edges of the incision and the peritoneal sheath. The parenchyma is loosened and lacerable, and the structure becomes more apparent from the enlargement of the acini, which gives the broken surface a granular appearance; the acini become altered in shape, and assume an oval form; their circumference becomes transparent, so that each acinus seems imbedded in a gray or grayish-red layer of gelatinous matter, with which it is however intimately blended. In the advanced stage of inflammation, the granulated structure disappears, the tissue seems perfectly uniform, and the broken surface has a laminated appearance. The organ has a paler colour, and it is almost uniformly brown, or grayish-red in some parts, or yellowish-red or pale yellow in others. The capillary vessels are filled with albuminous and fibrinous coagula.

If the process extend to the circumference, the peritoneal investment becomes opaque, thickened, and is easily detached; in many cases it is inflamed, and covered by an exudation of varying thickness.

Acute inflammation frequently leads to suppuration of the parenchyma and to hepatic phthisis. We then find small spots of pus occurring here and there in the infiltrated tissue, which gradually increase, coalesce, and form an hepatic abscess. The large abscesses found in the dead subject may almost always be proved to have resulted from a union of several smaller spots, by the remains of the fistulous passages that connected them, by the sinuous shape of their circumference, or by the debris of the former partitions.

The size of hepatic abscesses varies. They are often of the size of a fist, or a child's head, and may even occupy an entire lobe.

The seat of the abscess corresponds with the seat of the previous inflammation; it therefore most commonly occupies the right lobe, is generally found in the deeper parenchyma, and is often accompanied by an abscess in the left lobe, or extends into the latter.

The recent abscess represents an irregular cavity with uneven parietes, which are infiltrated with pus and consequently very friable; prolongations of the same tissue project into the cavity.

The abscess increases by fusion of the adjoining tissue, and thus assumes a round form, which becomes sinuous if a communication is established with other abscesses.

When the suppurative process has reached the boundary of the original inflammation, it meets, if no further inflammatory reaction is established in the vicinity, with infiltrated, tumid, and discoloured parenchyma. In this manner the abscess may remain passive for a considerable period, retaining the shape and other characters above described. It is commonly lined by a suppurating and loosely-attached membrane. In reference to its contents, the hepatic abscess presents considerable differences at different periods, depending in part upon the communication established with the biliary vessels. The pus contained in the recent abscess is mixed with little or no bile, as the acini and the capillary gall-ducts have become obliterated by the inflammation; the bile contained in them at the commencement of the inflammatory attack is at most found in combination with the pus. A large abscess of long standing, invariably contains pus mixed with a considerable amount of bile, which arises from the communication established between the cavity and larger gall-ducts. These are, like the bronchi, affected by a continuation of the suppurative process, and are generally eaten across in a transverse or slanting direction; and in exceptional cases only, and in very large abscesses, are they attacked and opened laterally. The pus contained in old abscesses is always discoloured, generally greenish, and possessing a strong ammoniacal odour: we must undoubtedly attribute to it the extensive discoloration of the surrounding parenchyma. The blood-vessels opening into the abscess are blocked up, so that hemorrhage very rarely occurs.

Before a fatal issue takes place, the hepatic abscess may discharge its contents in different directions, and with various results. The discharge is very rarely effected into the peritoneal sac, as from the peritoneal investment having been either primarily or secondarily involved in the inflammatory process, adhesions will have been formed, which prevent this occurrence. We have to notice the following modes of discharge:

α. The hepatic abscess induces suppuration in and between the thoracic and abdominal parietes, and after a communication has been established between the former and the superficial abscess, it discharges externally by straight or sinuous, narrow or wide passages; and by this means a cure is sometimes brought about.

β. The diaphragm may be perforated, and a discharge be effected into the right pleura, where, sooner or later, fatal inflammation is set up; or if the lung had previously been agglutinated to the diaphragm, suppuration of the pulmonary lamina of the pleura follows, and an opening being effected into the bronchi, pneumonia and pulmonary abscess supervene.

γ. The hepatic pus may be eliminated by the bronchi.

δ. The contents of the abscess may be discharged into the stomach, the duodenum, and the colon; and in these cases the hepatic abscess is reported to have healed.

ε. A discharge may take place into the gall-bladder, or more frequently into one of the larger branches of the hepatic duct, the hepatic pus is conveyed to the intestine by a longer passage, and thus escapes.

ζ. Cases in which the central aponeurosis of the diaphragm is perforated, and the pus discharged by longer or shorter sinuses into the pericardium, inducing pericarditis, are very rare. They have been observed by Smith and Graves, and once by ourselves.

η. Finally, very rare cases have occurred in which the hepatic abscess has discharged itself into large vessels, such as the vena cava; we have observed a case in which a communication was established between an hepatic abscess and the vena portæ and duodenum.

A cure of the hepatic abscess is effected after the pus has been discharged by one of the above-described methods, or it may result without this occurrence from more or less complete absorption of the pus by the cellulo-vascular membrane investing the sides of the abscess; for, as soon as that portion of the parenchyma which has undergone purulent infiltration is entirely broken down, the abscess comes in contact with a surface of tissue which is in a less inflamed state, or which does not put on any reaction till now. This, however, gives rise to an exudation, which invests the smoothened surfaces of the abscess, and after being repeatedly redissolved, at last forms a permanent coating. The subjacent layer in the interim has been converted into fibro-cellular tissue, and the cellulo-vascular investment becoming incorporated with the former, induces a gradual absorption of the inclosed pus, the walls of the abscess gradually approach one another, and at last unite to form a callous cicatrix. Not unfrequently a remnant of pus, which is converted into a cheesy concretion, and gradually becomes cretified, may still be found locked up in the tissue of the cicatrix; the parenchyma, lying above the situation of the original abscess, is found collapsed; and if the abscess extended to the circumference, the hepatic peritoneal lamina forms a cicatrized, dense, shrivelled covering.

The true grandular tissue of the acini, and the interlobular tissue, are undoubtedly to be considered as the seat of the inflammation we have just examined; it must be carefully distinguished from inflammation of the capillary gall-ducts, as well as from abscess resulting from suppuration in the latter, which is characterised by its large admixture of bile. We shall advert to this form in connexion with diseases of the gall-ducts.

In the same manner we have to distinguish between the hepatic abscess above described, and secondary or metastatic purulent deposits.

Induration and obliteration of the hepatic parenchyma are the more frequent result of slight and chronic inflammatory attacks. The product of inflammation solidifies, and the hepatic parenchyma becoming obliterated, is converted into a cellulo-fibrous callosity, which gradually contracts, and induces a collapse at the surface of the liver proportionate to its vicinity to the surface. If this occurs simultaneously at several points, the surface of the organ obtains an uneven, undulated, and slightly lobulated appearance. These accumulations of cartilaginous tissue are to be carefully distinguished from the obliterations and atrophy which affect the hepatic tissue, as a result of obliteration of the portal ramifications consequent upon phlebitis.

The investigation of true chronic inflammation of the liver offers still greater difficulty, inasmuch as, in the dead subject, we generally have to deal with its products only, in various degrees of development; many cases of the so-called granular liver are probably referable to this head. At the bedside the most heterogeneous conditions, when accompanied by tedious and oppressive morbid sensations and by painful symptoms, especially by enlargement, are diagnosed as chronic inflammation of the liver.

c. *Inflammation of the vena portæ.*—This is, under all circumstances, a very important affection. It occurs both in a primary and in a secondary form, and may in either lead to obliteration or suppuration, and may attack the trunk and the ramifications of the vessel, or the latter only.

Inflammation ending in obliteration of the branches of the vena portæ within the liver demands a special notice, as it occurs very frequently, although we rarely have opportunities of investigating it in the dead subject otherwise than in its termination and its consequences. It would appear to be owing to an anomalous condition of the portal blood, and to belong to the adhesive form. Several cases that we have observed, in which irregular anastomoses were discovered between the portal and the general venous system, by means of the patulous umbilical vein, seem to authorize this view.

Under certain indented and contracted parts of the surface of the liver, we discover an accumulation of cellulo-fibrous callous tissue, which, on more minute examination, is found to conduct to a larger or smaller portal branch, with which it is connected. The vessel itself is converted into a ligamentous cord, or it is plugged up with a fibrinous, cheesy, or calcareous deposit.

The consequences of the obliteration are, atrophy of that part of the liver which is supplied by the ramifications of the vessel, lobulation of the liver, as described at page 126, and in extreme cases, ascites.

d. Deposits, metastases in the liver.—Metastases occur in the liver under the same conditions under which they take place in the lungs. They are, however, much less frequent in the former than in the latter and in the spleen; and the so-called hepatic abscess, more especially consequent upon important surgical operations, wounds and injuries of the cranium, is found much more rarely than has been hitherto supposed. Besides, we always simultaneously discover deposits in other organs, particularly in the lungs and the spleen. We are unacquainted with the special conditions which give rise to a predominant deposit in the liver, with the exception of those cases in which the source of the poisoning of the blood is within the compass of the portal system.

The deposit in the liver is also caused by the deposition or exudation of fibrine through the coats of the capillaries into the tissue, or by the coagulation of the blood in the capillary rete of vessels. In both cases metamorphoses may ensue which vary according to the nature of the morbid essence absorbed into the blood; occasionally induration and shrivelling are induced, with consequent obliteration of the parenchyma and the capillaries; more frequently purulent or ichorous fusion result, and then either suppurative inflammation of the surrounding parenchyma is established, or a solution of the coats of the capillary vessels is effected.

The deposit presents, as in the lungs, the appearance of a circumscribed nodulated accumulation of a dark-red or brownish-red colour, which, as it approaches the state of fusion, is converted into a dirty yellow or greenish colour.

The deposit has a rounded form, varying in size from that of a pea to that of a walnut; it is found in considerable numbers, and is commonly seated in the peripheral layer, where it gives rise to inflammation of the hepatic peritoneal lamina. This is a guide to distinguish it from the abscess which originates in idiopathic inflammation of the liver; the diagnosis is also aided by the acute course of the affection, by its originating in another morbid affection, by the typhoid symptoms, by the occurrence of similar processes in other organs, more especially in the lungs and the spleen, by the disorganization of the blood, and the resulting jaundice.

e. Gangrene of the liver.—Gangrene of the liver is very rare, in fact Ferrers and Bérard deny its occurrence, but we have seen it in one well-marked case, associated with pulmonary gangrene. It is developed in parts affected with inflammation and suppuration, not so much as a result of intense inflammation as of certain peculiar conditions, which cause a tendency to gangrenous degeneration. It occurs in more or less circumscribed spots, in which the parenchyma is dissolved into a brown or greenish-black pulp, which diffuses the characteristic odour of sphacelus. We find suppuration in the vicinity which is the product of reactive inflammation, and which defines the boundaries of the mortified part.

f. Granular liver.—Granular liver is one of the most important, though in many respects, and especially in reference to its pathogeny, one of the most enigmatical affections of the liver; it is termed by Laennec cirrhosis, older authors have considered it identical with or related to scirrhus; and if viewed in reference to its termination only, it may be called induration of the liver.

It undoubtedly presents many degrees, which merge into one another; from the very unsatisfactory state of our knowledge however, in reference to the elementary process and fundamental nature of the disease, we consider it necessary to sketch the affection as seen in a marked case, without any further complication, and subsequently to state what is known of the earlier stages of the disease, and of the later metamorphoses of the organ.

In a case of the kind alluded to, the viscus appears considerably diminished in size, and this decrease is accompanied by a characteristic change of form. The margins are thinned down to such a degree, as to represent a cellulo-fibrous seam, which is folded upon the remainder of the organ, the vertical diameter of the liver has increased, and is found to consist chiefly of the hemispherical or globular right lobe. (Vide p. 125.)

The external surface presents a granular, warty, racemose appearance, which results from the projection of the peripheral so-called granulations of the liver. These granulations may all have the same size, e. g. that of a hemp seed, and the surface then is uniformly racemose; or they vary in size, and the surface is then unevenly racemose.

The hepatic surface intervening between the granulations is of a dull white colour, tendinous, shrivelled, and contracted; the granulations are thus circumscribed, separated from one another and even occasionally pediculated.

The viscus, when it has this appearance is to a certain extent elastic and tough, and even indurated, so as to offer a cartilaginous resiliency; it cannot be broken, as it possesses the tenacity of leather.

The scalpel itself confirms the fact of induration, as the instrument meets with a scirrhoid substance, which may even cause a crunching sound.

A section shows the above-mentioned granulations to be either isolated or grouped together, an accumulation of dirty white, dense, resilient cellular tissue, which is almost destitute of blood-vessels, and which forms a nidus for the former, is seen between them.

The colour of the organ is variously modified; being dependent upon the colour, either of the granulations, which we shall have still further to examine, or of the intervening fibrocellular tissue.

The liver is frequently attached to adjacent parts, especially to the diaphragm, by means of cords or laminæ of new matter; the adjoining peritoneum, and especially the peritoneal covering of the gall-bladder, and the folds which leave the liver, are opaque, shrivelled, and tendinous.

The granulations have given rise to the name of granular liver; and from the coexisting atrophy and diminution of size, the affection is also termed granular atrophy of the liver.

The granulations are the most prominent sign in the sketch we have given, and the question arises as to their nature.

Laennec viewed the granulations as an adventitious product, and as his specimens offered a yellow colour, he termed it cirrhosis (κιῤῥός, fulvus).

One may easily be convinced of the incorrectness of this view, as a careful examination at once proves that the granulations consist of nothing but hepatic parenchyma, which, however, as we shall subsequently have occasion to show, is variously modified.

It follows from our demonstration that in granular liver the hepatic parenchyma has become reduced to the granulations, and that the portion which has disappeared, has been replaced by fibro-cellular tissue.

The desire to obtain more accurate views as to the nature of the granulations and their mode of origin, has caused the promulgation of various doctrines which are untenable or incomprehensive in proportion as their authors attached too much importance to the ideas of hypertrophy and atrophy and their combination, or attempted to construct a theory from isolated observations, or because they did not sufficiently distinguish between the diseases of the hepatic parenchyma preceding the formation of granulations, and those affecting the granulations themselves, and other morbid conditions not essentially connected with them.

According to Bouillaud, with whom Andral coincides in the main, the granulations are the result of hypertrophic development of the so-called white or secreting substance, accompanied by obliteration and gradual atrophy of the red or vascular tissue.

Cruveilhier advocates a different opinion. He thinks that cirrhosis consists in the atrophy of a considerable number of the hepatic acini, accompanied by hypertrophy of the remainder, which, as it were, take the place of the former.

We pass over the unsatisfactory and erroneous doctrines of other writers, which are based upon investigations of solitary cases, or of anomalies in the elementary tissue, and merely remark that we do not adopt any one of the above views exclusively, as they do not appear to us to embrace the entire characters of granular liver.

Granular liver presents considerable varieties. The granulations themselves offer numerous variations in reference to texture, number, size and form.

With regard to their texture we sometimes find that they consist of normal, or at least tolerably normal, hepatic parenchyma. Commonly however this is not the case; the parenchyma of the granulations is itself abnormal, and variously diseased; such cases render the analysis of the hepatic granulations difficult, and cause errors in the conclusions arrived at, as not sufficient attention is paid to the distinction between the essential and non-essential characters of the abnormity. The alterations of tissue in the granulations are either such as constitute the *causa proxima* of the entire metamorphosis, i. e. they are essential, or they are mere accidental complications, which may either precede or accompany the formation of granulations. As we shall subsequently have to show the development of the granulations from the former, and as we are also compelled to examine into the complications of granular liver, we here give a summary of the abnormal conditions, without reference to the above distinctions.

Firstly. The parenchyma of the hepatic granulations occasionally presents a coarse-grained hypertrophy of the acini, the granulations projecting on a sectional surface in the shape of dark reddish-brown and elastic points.

Secondly. It frequently appears in the various degrees of the nutmeg liver (Laennec's cirrhosis of a low degree).

Thirdly. The granulations appear in the shape of rounded or lobular convolutions of dilated, turgid, yellow, gall-ducts, the red vascular substance in the vicinity having disappeared. This yields one of the commonest and most exquisite forms of the granular liver; it is genuine cirrhosis, which originates in the first variety of the nutmeg-liver, dependent upon stasis and dilatation of the biliary ducts. The majority of authors have evidently taken their description of granular liver from specimens of this kind.

Fourthly. The parenchyma of the granulations is frequently infiltrated with fatty matter or similar products, and the granulation then presents on a small scale all the signs discussed at page 119. Gluge has evidently employed a specimen of this description for his investigations.

Fifthly. We occasionally find the granulations in the condition of what we have termed yellow acute atrophy; they are then yellow throughout, and appear at the surface and on section as pulpy, collapsed, friable, yellow masses.

Sixthly. The parenchyma of the hepatic granulations frequently presents symptoms of an inflammatory condition; it then appears pale, of an homogeneous structure, with obstruction of the small biliary canaliculi, commencing induration and obliteration.

The granulations vary much as to number, and are either uniformly distributed through the surrounding cellulo-fibrous tissue, or they coalesce into groups of various extent. The more numerous they are, the less the hepatic parenchyma is destroyed; the number of the granulations therefore indicates the degree of atrophy that has taken place, and, if we take the quality and quantity of the textural changes into consideration, the stage of the disease generally.

The size of the granulations varies from that of a pin's head to that of a horse-bean, according as a single acinus, or an entire lobule, or a large portion of the organ is affected; they are generally of a rounded form, though they are very frequently of an irregular and especially of a lobulated shape. In the majority of instances we find one size and form to prevail.

The cellulo-fibrous tissue intervening between the granulations, is either diminished or increased in amount. There is generally an inverse ratio between this tissue and the number of granulations; but we find exceptional cases in which the granulations are very numerous, and the interstitial cellular tissue is also much increased. The latter varies much as to density, resiliency, vascularity, succulence, and colour. Sometimes it is loose, friable, vascular, more or less reddened, and succulent; at other times it is tough, less succulent, of a dirty gray or greenish colour, at others again, dense, indurated, dirty white, of fibro-cartilaginous, scirrhoid, resiliency and elasticity, crepitating when cut, &c.

Having discussed the two constituent parts of granular liver, we must now examine into the origin of the metamorphosis.

We have seen that in granular liver the granulations represent the persistent hepatic tissue, and that the parenchyma which has been removed is replaced by cellulo-fibrous tissue. The question arises whether this reduction is primary or secondary, and supposing the latter case, which is the primary anomaly? It is commonly set down as mere atrophy, in consonance with the view of the French observers above quoted.

We are not of opinion that granular liver always takes its origin in the same fundamental affection; we are inclined to adopt two morbid states as the essential and original anomalies, which give rise to granulations in the hepatic parenchyma as a secondary affection.

a. In one case there is a morbid development of the capillary gall-ducts (the so called secreting tissue); an accumulation of the secretion, and probably also an hypertrophy of the parietes of those vessels giving rise to the nutmeg liver, and to an obliteration of the capillary blood-vessels, the so-called vascular substance. We then have to do with the gradual reduction of the organ, already described under the head of atrophy, as an advanced stage of cirrhosis; in this condition granular liver takes its origin, for the granulations are formed by the biliary ducts coalescing into rounded fasciculi or coils of the size of a pin's head or hemp seed. They are more or less of a yellow colour, containing fat, and either solitary or collected into lobular groups; they are surrounded by a spongy, cellular, soft succulent, red and vascular tissue, from which they can only be separated by rupture of the latter and of its vessels. This anomaly is commonly met with in various degrees of development at different parts of the viscus; it is generally more advanced in the peripheral portions, the deeper portions presenting at the same time the appearance of the nutmeg degeneration; the liver is frequently enlarged, but certainly not diminished in size, and preserves the thick, massive edges peculiar to the nutmeg liver.

A secondary metamorphosis now gradually supervenes, the stage of obliteration and atrophy. The interstitial tissue gradually loses its vascularity, its red colour, succulence, and spongy texture; it becomes more and more pale, of a grayish-red, and dirty white colour; it shrivels up, and becomes denser and drier, coriaceous, and even of scirrhoid hardness; and it presents a cellulo-fibrous, fibro-cartilaginous structure. The granulations at the same time undergo important modifications. The obliteration of the interstitial tissue not only destroys the vascular connexion between the latter and the granulations, but, as their nutrition becomes impaired, their secreting power also ceases. We now find the granulation inclosed in a cellulo-fibrous case, from which it may be easily removed, as it is only connected with its investment by a few delicate cellular threads, or is even quite detached, with the exception of a single vascular pedicle; it is found collapsed, pulpy, of a dirty-yellow colour; it gradually diminishes in size, the surrounding tissue also becoming atrophied; it soon appears only as a minute yellow or greenish spot, and at last vanishes entirely. In exceptional cases, in which the liver has become so much indurated as to be incapable of further condensation, the tissue surrounding the individual granulations is converted into a cyst with a serous lining, in which the granule floats, attached only by a vascular foot-stalk, and surrounded by a yellowish or pale green, watery, or gelatinous fluid. In consequence of the vascular obliteration, it is gradually so much reduced as at last to present nothing but a minute nodule attached to the internal surface of the cyst, which is now entirely filled with the fluid.

In this variety, therefore, the original anomaly consists in the hepatic parenchyma being gradually reduced to the capillary gall-ducts which have assumed the shape of the granulations; and in so far as this is genuine cirrhosis of the liver, it certainly bears some resemblance to the pulmonary cirrhosis described by Corrigan. The secondary metamorphosis causes a gradual atrophy of the granulations, accompanied by a predominance of the interstitial cellulo-fibrous tissue, and a uniform diminution of the entire organ.

The degree attained by the metamorphosis is proportionate to the number of obsolete granulations, or to the amount of parenchyma remaining capable of performing its functions;

the organ decreases in proportion to the shrivelling and condensation of the interstitial, cellulo-fibrous tissue; and it often appears reduced to one quarter, or even one sixth, of its ordinary size. The condensation of the cellulo-fibrous tissue, as it gives rise to a decrease of the organ, also induces a corrugation and shrivelling of the peritoneal investment. The latter will be more or less opaque, and thickened; and, being retracted between the projecting granulations, these not unfrequently appear to have a neck-like contraction. These changes in the hepatic peritoneal covering take place without any symptoms of inflammatory action.

The secondary metamorphosis chiefly affects the margin of the liver, and more particularly the left lobe. The organ very commonly appears to have been almost or entirely deprived of parenchyma, and to consist exclusively of fibro-cellular tissue, the edges more particularly being thinned off and turned back upon the body of the organs, the left lobe of which is converted into a mere appendix of fibro-cellular structure of the size of a hen's egg or a walnut.

Not unfrequently the granulations assume, in the advanced stages, and after a long duration of the disease, a bluish or dark-green colour, which particularly affects those seated at the concave surface of the liver.

This form of cirrhosis of the liver undoubtedly originates in hyperæmic states, a view that is confirmed by their frequent connexion with organic disease of the heart; its frequent occurrence in drunkards also points to a peculiar anomaly in the constitution of the portal blood.

β. In the second case, the original affection of the hepatic parenchyma in granular liver is proved, by the post-mortem appearance of the granulations, to consist in a slow chronic inflammation. This induces a gradual obliteration of the parts attacked, and their conversion into fibro-cellular tissue, the amount of which varies in proportion as the processes of absorption or of organization predominate in the inflammatory product. This secondary metamorphosis, from not occurring uniformly, results in a subdivision of the organ into larger or smaller scattered compartments, which present the characteristic rounded form of the granulations in the same ratio as they correspond to single hepatic lobules. Their parenchyma is frequently found in the original state of chronic inflammation, but it may be unchanged, or it may offer one of the other accidental anomalies alluded to.

It is intelligible that the diminution of size in this variety is often inconsiderable, that the organ may even be enlarged, and that the fibro-cellular tissue is accumulated in such a manner as to preponderate over the parenchymatous cellular tissue. A marked decrease of size occurs when the obliteration is extensive and the cellulo-fibrous tissue has shrunk; and as this decrease advances, the pressure exerted by the shrivelled tissue upon the parts not originally affected by the anomaly, induces an atrophy in them; they fade, and put on a rusty or dark yellow colour.

Granular liver frequently presents an abnormity which appears peculiar to this variety. We allude to the presence on the condensed peritoneal investment of pseudo-membranous formations, of a cellular or cellulo-fibrous texture, which generally extend to the diaphragm in the shape of corded adhesions. They are the result of inflammatory processes, which have become extinct long before the occurrence of the secondary metamorphosis, and which appear to afford evidence of the inflammatory nature of the hepatic disease itself.

Besides these two modes of development of granular liver, the affection may also be viewed as a retrograde process, manifested in depositions or infiltrations of the hepatic parenchyma, arising from an anomalous state of the blood.

In reference to the external conformation of granular liver, we have still to advert to a variety which is characterised by the hepatic parenchyma not being reduced to granulations, but continuing in larger masses, the more superficial of which are pushed out by the shrinking interstitial tissue, and being more or less contracted at their base, cause the entire organ to appear lobulated.

Granular disease of the liver is found complicated with all the essential or accidental anomalies which we have described as occurring in the parenchyma of the granulations, and these anomalies may either precede the granular disease or supervene after its development. The complications may be hypertrophy, nutmeg liver, cirrhosis, adipose and other infiltrations, acute yellow atrophy, inflammatory and other hepatic diseases. The granular disease arising from one of the essential anomalies, e. g. from inflammatory causes, is more particularly liable to combine with another essential anomaly, as for instance, with true cirrhosis.

The complication with adipose deposit is peculiarly interesting. The latter may,—

Firstly, be the primary affection upon which the granular disease is grafted in the shape of cirrhosis. As the cirrhosis advances, the reduction of the organ generally, but more particularly of the marginal portions which have been infiltrated with fat, is impeded, and the atrophy that does take place is characterised by its affecting the margin much less than in the uncomplicated form.

Secondly; the adipose deposit may supervene upon a granular state of the liver; and if it does so before the secondary metamorphosis has advanced very far, and whilst the granulations are still very numerous, it may prevent the liver from assuming the form peculiar to the granular condition. If it occurs at a later period, it need not modify the characteristic form of the organ.

Thirdly; the cirrhotic and shrinking granulation which is cut off by dense cartilaginous interstitial tissue may degenerate into a flabby, dirty yellowish-brown fat-lobule, the degeneration apparently proceeding from the confined biliary matter.

A similar relation exists in regard to the modifications of form between the granular condition and other infiltrations of the hepatic parenchyma.

Granular liver is also very frequently coincident with the most various morbid affections of the heart, which give rise to congestion in the vena cava and in the portal system; of these, hypertrophy, dilatation, and valvular disease are the most common. Disease of the heart must be considered as an important momentum in the origin of the hepatic disease.

The symptoms resulting from the granular state of the liver bear a ratio with the degree of its development; the impermeability and obliteration of its secreting tissue induce, on the one hand, congestion in the portal system, hyperæmic states of the intestine and of the peritoneum, a blennorrhoic condition of the former, tumefaction of its membranes, and ascites;

on the other, dyscrasic conditions of the blood allied to scurvy and frequently accompanied by icterus, an inclination to exudative processes, with an especial proclivity to hemorrhage, anasarca, and anæmia.

We cannot admit that the relation existing between Bright's disease of the kidneys and granular liver, though the two often coexist, has been accounted for. In one set of cases both affections would seem to have originated in common causes; in another, Bright's disease is evidently of more recent date, and has supervened upon the existing granular state of the liver; but whether in this case it is due to a separate cause, or is owing to the dyscrasia accompanying the hepatic disease, we are unable to determine.

Granular liver is invariably a chronic affection, which may often be arrested in its development for a short time, but never permanently. It terminates fatally by inducing anæmia and tabes complicated with dropsy; by disorganization of the blood, by exhausting and paralysing exudations on the serous membranes, and especially on the peritoneum. It rarely occurs before the prime of life, but we have seen one case of it at the age of seventeen.

g. Adventitious growths. *α*. Anomalous production of fat.—This occurs in two distinct forms. We have already become acquainted with one in the shape of adipose deposition, or infiltration of the hepatic tissue with free fatty matter; the second is very unusual, and appears as a lipomatous morbid growth of a rounded or lobulated form, and rarely larger than a pea.

β. Cavernous tissue.—This is remarkable from its frequent occurrence in the liver. It resembles the tissue of the corpora cavernosa, and is commonly found in the peripheral substance of the liver only; from its dark blue colour it shines through the peritoneum, and the affection is therefore recognised on the external examination of the organ. It varies in size, from that of a hemp seed or pea to that of a hen's egg, and more; is generally irregular in form, and its cells contain a large quantity of dark blood; a connexion may be always traced between the latter and some larger portal vessel. According to the amount of blood contained in the compartments, these are found in the dead subject projecting beyond the surface of the liver, or collapsed and sunk. Sometimes they are single, sometimes numerous.

γ. Cysts.—The liver is more liable to the formation of encysted tumours than any other parenchymatous organ; and we repeat that the rarity of tubercular deposit in the liver enhances the importance of the hydatid theory. We find in the liver—

αα, The simple serous cyst, a serous sac containing a clear watery fluid; this is not met with as often as

ββ, The acephalocyst of Laennec; which in the first instance is merely a serous, but from acquiring a fibrous investment, is converted into a fibro-serous sac, containing, besides serum, the so-called acephalocysts; these are small bladders (hydatids), formed of coagulated albumen and filled with an albuminous fluid; they vary in size and number, and are either attached to the parietes of the former or float in the serum.

The acephalocyst generally atttains a considerable size in the liver. We have several extraordinary specimens in the Viennese museum, and there is one of a foot in diameter. In proportion as the heterologous growth increases, the hepatic parenchyma gives way, and the nearer the former originally was to the surface, the sooner will it reach the peritoneal investment; it then projects above the liver, with a larger or smaller segment of its circumference. Under these circumstances the peritoneum invariably inflames, and the consequence is a thickening of the latter upon and in the vicinity of the acephalocyst; an investment of pseudo-membranous cellular tissue is formed, by which the viscus becomes attached and agglutinated to adjoining organs.

Sometimes there is but one, sometimes there are several of these cysts; in rare cases, the entire liver appears converted into an aggregation of larger or smaller sacs. In the latter instance, two or more are often found to communicate with one another; either in consequence of atrophy of their parietes from pressure, of rupture from inflammation, or from a sudden increase in their contents.

The right lobe of the liver is the ordinary seat of the acephalocysts; the largest are always found at this part.

Acephalocysts are liable to inflammatory attacks, which entirely resemble those of normal serous and fibro-serous membranes, both in regard to the exudations they give rise to, as to their terminations and consecutive results. They may, by causing suppuration and obliteration, destroy the vitality of the acephalocysts, and thus bring about a cure.

The hepatic acephalocyst may discharge its contents in various directions; the portion that projects above the surface of the organ, and has lost the support it previously received from the surrounding parenchyma, may become atrophied and thinned, or its tissue be weakened or destroyed by inflammation and suppuration, and thus communicate directly with the abdominal cavity; or having first become agglutinated to neighbouring viscera, it may perforate the latter and discharge externally, or into other cavities and canals. The contents may thus make their way

Into the right pleura, or into a pulmonary abscess, and be removed by the bronchi:

Into the intestinal cavity, and especially into the duodenum and transverse colon, so as to pass off by vomiting or defecation:

Into the gall-ducts, i. e. into a large branch of the ductus hepaticus, by which passage they may ultimately be conveyed into the intestine; though the protrusion of the acephalocyst more frequently induces dangerous obstruction of the biliary passages:

In rare cases, into a neighbouring blood-vessel, and lastly:

Into a neighbouring circumscribed abscess, resulting from peritoneal inflammation.

Occasionally the acephalocyst opens in various directions at once. After the discharge of its contents, obliteration of the sac and cure, sometimes follow.

The contents of the sac are discharged unaltered or changed, according to the process accompanying its perforation; the products of inflammation in the matrix, or of the parietes of other cavities (e.g. the pleura), the bile, the intestinal secretions, &c., are particularly prone to induce a maceration and complete solution of the acephalocyst.

On the other hand, not only the parietes of the investing sac are often found saturated with bile, but the bile extravasated from large gall-ducts is frequently mixed with its contents, and its parietes are incrusted with inspissated bile. In the same manner we may now and then discover blood in the cyst, which has been discharged from neighbouring vessels.

The hepatic parenchyma is forced out of its position in proportion to the size and number of the cysts; if otherwise affected, it presents the nutmeg degeneration.

Acephalocysts in the liver are frequently complicated with affections of the same kind in other organs, as the lungs, spleen, and kidneys; the disease is also complicated with cancerous affections in other organs. Large acephalocysts of the liver give rise to ascites or peritonitis, and may thus prove fatal.

In reference to the etiology of these growths, it appears, according to some observations, that mechanical injury of the liver and intermittent fevers may influence their development. They seem not to occur before puberty.

δ. Tuberculosis of the liver.—Contrary to the received opinion, we assert that the liver is rarely the seat of tubercular disease. It scarcely ever occurs in this organ as a primary affection, but is not unfrequently found as a secondary complication of advanced primary tuberculosis in another organ, or of universal tubercular disease. It must, therefore, almost always be considered as the expression of advanced tubercular cachexia.

Hepatic tubercle occurs in the shape of semi-transparent, grayish, crude, miliary granulations; in which case it is more especially the product of acute tuberculosis; or as yellow, cheesy, adipose deposits, of the size of a hemp-seed, or pea, or more. It is consequently often larger than pulmonary tubercle; but, on the other hand, with the exception of very rare cases, is much less extensively disseminated than the latter.

Hepatic tubercle is not limited in its seat to a particular section of the viscus, but attacks all portions indiscriminately, and the more so, the acuter its course.

The tubercular matter is deposited in the parenchymatous cellular tissue of the organ, and especially in that pertaining to the biliary capillaries. It very frequently surrounds a minute gall-duct, and thus presents a central canal, which gives rise to a biliary discoloration of the nucleus.

When the liver is attacked by acute tuberculosis, its appearance resembles the parenchyma of other organs similarly affected; it is in a peculiar state of turgescence, the tissue is relaxed, friable and pale, and gorged with a serous or sero-sanguineous fluid. All this will be the more evident, the more rapidly the tubercular deposit is effected, and the more the universal cachexia is developed.

The conditions under which hepatic tubercle occurs, render it apparent that it rarely passes into the stage of softening, and scarcely ever into that of cretification; the constitutional affection generally proves fatal from its violence and diffusion, before the tubercles of the liver have undergone these metamorphoses. Still we do occasionally find that, from the very violence of the constitutional affection, a solution of hepatic tubercle is effected; and then it is probably the yellow variety which is converted into a primary hepatic vomica, and which offers no peculiar characters beyond the biliary discoloration of its contents.

We do not, however, meet with a condition accompanying tubercular suppuration in the liver which may be considered analogous to pulmonary phthisis.

This vomica requires to be the more carefully distinguished from morbid dilatation of the gall-ducts, as the latter not only occurs frequently, or almost invariably, in combination with hepatic tubercle, but is not unfrequently coexistent with tubercular disease of other organs. In this case small cavities, of the size of a millet-seed or a pea, filled with viscid, muco-bilious, dirty green matter, with flaccid parietes, are found scattered through the liver, which on close examination are found not to be tubercular, but to be dilatations of capillary gall-ducts. The hepatic tubercles exist at the same time, and at various distances; a tubercle may occasionally be found near one of these cavities, but it is not characterised by the symptoms of secondary deposit accompanying the fusion of tubercular matter.

The conditions of their origin, and their connexion with the constitutional disease, have not been as yet ascertained; but we are warranted by numerous observations in stating, that they invariably indicate a high degree of the constitutional affection; and a tendency to universal tubercular deposition, and especially in the abdominal viscera.

Hepatic tubercle may be complicated with tubercular affections of almost all organs, as might be assumed from its originating in an advanced stage of tubercular dyscrasia; however, the abdominal organs are found chiefly implicated, viz. the abdominal lymphatic glands, the spleen, the peritoneum, and the intestinal canal.

ε. Carcinoma of the liver.—Carcinoma of the liver is a disease of much greater importance than tubercular deposition, as it occurs very frequently, and is often a primary affection.

Although we do not coincide with Cruveilhier, as to the frequency of its occurrence, it still must be considered as a common affection, and we would give its numerical relation to carcinoma of other organs as one to five. The greater frequency of its occurrence, as compared with tubercle of the liver, and considered in reference to the frequency of both affections in other organs, and especially in the lungs, and to the facts connected with the formation of cysts in the lungs and the liver, is a matter of particular interest.

These remarks apply to carcinoma of the liver generally, but not to its different varieties; of these, some are frequent, some occur less frequently, some very rarely.

Four varieties of carcinoma are found in the liver, which we will examine in succession.

αα. Areolar cancer.—This form occurs so rarely, that it is never described among hepatic affections. One case of very extensive areolar cancer has come under my notice.

ββ. Carcinoma fasiculatum sive hyalinum (Müller). Although not as frequent as the following, it undoubtedly occurs often. It is generally taken for medullary carcinoma, and the mistake is accounted for by the fact that the two often coexist. It forms masses of the size of a filbert to that of a man's fist, which are surrounded by an investment of delicate cellular tissue; though the surface is uneven and lobulated, the general outline is round; its consistency varies, being sometimes but slight, at others almost cartilaginous; its colour a pale yellowish-red, and generally of almost vitreous transparency. The carcinomatous masses are commonly found in considerable numbers, and like medullary cancer, they cause rounded protuberances of the viscus, and produce an increase in its weight and size.

γγ. Medullary carcinoma.—This is the most common form of hepatic cancer, and almost all investigations that have hitherto been made in reference to this subject, treat of this variety only. It occurs either in the shape of detached masses, or as an infiltration of the hepatic parenchyma.

aaa. The detached masses occur as tumours, which offer many peculiar features.

Their general form is spherical, though their surface not unfrequently is slightly racemose or lobulated. Those which have been developed in the peripheral portion of the organ, and are therefore in contact with the peritoneum, present a flattened, or even an indented surface, and the indentation may extend to the very nucleus of the morbid growth. The peritoneal lamina in the indentation is opaque and thickened, owing, not as is commonly thought, to cartilaginous induration, but to an homologous cancerous degeneration of the serous and sub-serous tissue. This condition of the peritoneum is analogous to the relation the common integument bears to subjacent cancerous growths.

In size the medullary cancer varies from that of a millet- or hemp-seed to that of a man's fist, a child's head, and more. In most instances morbid growths of various sizes are found in the same individual. The larger those are which occupy the peripheral portion of the organ, the more prominent will be the protuberances on the surface.

The number of these adventitious products varies equally; sometimes there are but a few, or even only a solitary one is found; at others they are very numerous. The greater the number of those occupying the peripheral portion of the organ, the more numerous will be the protuberances on the surface. When the morbid growths are numerous and large, two or more often coalesce.

We are unable to discover any peculiarity in reference to their position; they commence equally in the peripheral and in the deeper-seated portions of the intestine. They commonly make their first appearance in the right lobe.

As regards consistence, we find two varieties which have also been considered as differing in texture. They do not, however, constitute essential distinctions, but are merely different degrees of development of the same morbid growth.

One is of the consistency of bacon, and presents on section a smooth, homogeneous, shining surface, of a dull white colour, and without a trace of blood-vessels. On pressure, a small quantity of a thick creamy fluid exudes from the meshes of a dense fibrous structure. These growths are not detached from the adjoining hepatic tissue without considerable difficulty; and a distinct cellular investment can scarcely be demonstrated. The growths belonging to this variety, when coexisting with the second, are always the smaller of the two.

The second presents the physical characters of true encephaloid disease; its general colour is milk-white, it is more or less vascular, and consequently in part gray, yellow, brownish-red, or even dark red; it is very spongy, and on pressure yields a large quantity of a thin milky fluid, which is contained in the meshes of a friable, fibrous tissue. The tumours are invested by a delicate cellulo-vascular sheath, and are easily detached from the hepatic parenchyma. When occurring simultaneously with the first variety, they generally form the large morbid growths.

The latter evidently represent an advanced stage of the morbid growth, as appears not only from the foregoing remarks, but also from the relations of the primary cell. (Vide vol. I.)

$\beta\beta\beta$. Infiltrated medullary cancer is analogous to the other infiltrations of the hepatic tissue, which we have already discussed. It always contains obliterated and obsolete blood-vessels and gall-ducts, which are gradually absorbed. The infiltration attacks larger or smaller segments of the viscus; it does not present distinct boundaries, but insensibly passes into the normal parenchyma. It rarely occurs without nodulated cancer. The carcinomatous mass presents the same two varieties in reference to consistence and to its elementary constitution. We find a transition from the diffused to the circumscribed form in the fact, that the nucleus of the latter is sometimes infiltrated hepatic tissue, which becomes endowed with independent growth, and merely forces the parenchyma out of its place.

The larger and the more numerous the carcinomatous masses are, the more extensive the cancerous infiltration, the more does the viscus increase in size and weight. The extra-cancerous tissue presents the nutmeg and adipose degeneration.

Medullary cancer is here, as elsewhere, the seat of hemorrhages, which are proportioned to the rapidity of its growth and the looseness of its texture. In rare cases it penetrates through the peritoneal investment of the liver, its development then proceeds with extreme energy, and it induces exhausting hemorrhages. In other cases it perforates the coats of large gall-ducts within, or of the biliary passages external to the liver, and grows into their cavities. In the infiltrated form we not unfrequently find extravasations of bile to a greater or less amount.

Medullary cancer rarely passes into suppuration, as it generally terminates fatally by inducing universal cachexia and exhaustion. Its fusion is still more rarely found to take place within a fibrous sheath, as is comparatively oftener the case in the spleen. Occasionally nature seems to attempt an arrest of the morbid growth, by a conversion into fat or adipocire.

Hepatic cancer undoubtedly very often occurs as the first of a successive series of cancerous deposits; yet, in the dead subject, it is commonly found combined with carcinoma of the lymphatic glands, that are seated near the biliary passages and in the lumbar region, with cancer of the stomach, of the intestine (especially of the rectum), of the peritoneum, of the kidneys, and with universal cancerous infection. It is often developed with remarkable rapidity after the extirpation of cancerous growths, and is then generally accompanied by cancer in the lungs.

γγγ. Medullary carcinoma not unfrequently occurs in the liver in the shape of *cancer melanodes* (melanosis), and equally as an infiltration, or in circumscribed masses. We find the most varied combinations of its elementary molecules with those of pure medullary cancer.

A common result of hepatic cancer making its way outwards, is inflammation of the peritoneum; the carcinomatous liver is consequently often found agglutinated to neighbouring parts by means of cellular or cellulo-fibrous tissue, which may in its turn be subjected to cancerous degeneration.

SECT. II.—ABNORMITIES OF THE BILIARY PASSAGES.

We now come to the consideration of the diseases of the gall-bladder and its efferent duct, those of the *ductus communis choledochus,* of the *ductus hepaticus,* and of the branches and ultimate distribution of the latter. We include the entire apparatus under one head, though we shall devote a special consideration to the peculiar characters exhibited by separate sections.

§ 1. *Excess and Defect of Formation.*—In rare cases a congenital absence of the gall-bladder has been noticed, an anomaly which must not, however, be confounded with obliteration of the gall-bladder which is frequently consequent upon inflammation. When there are two livers, the gall-bladder and the entire apparatus correspond; but we also find, without any further anomaly, a twofold instead of a single common duct; the two ducts then either both open into the duodenum, or one communicates with the duodenum, and the other with the stomach.

§ 2. *Irregularities of the Biliary Passages with reference to Caliber.*—Independently of congenital enlargement or diminution of these parts, we find important acquired anomalies in the shape of dilatation or contraction.

Dilatation either affects the entire apparatus from the duodenal orifice to the capillary gall-ducts equally or almost equally, or it only affects larger or smaller portions, whilst the remainder retains its ordinary size. The gall-ducts are capable of extreme distension.

We find that dilatation of the passages is caused by habitual accumulation of inspissated bile, and by everything that impedes the progress and the discharge of the secretion. We allude to compression of the biliary passage within and external to the liver by morbid products or enlarged lymphatic glands, to diminution of their caliber by tumefaction of the coats, by cicatrices or unusually large folds or valves of the mucous membrane; to obturation by biliary calculi, by morbid growths projecting into the cavity of the biliary passages, by catarrhal or croupy secretions. Some of these obstacles occur mainly in one, others in another portion of the apparatus. If the impediment occupies the ductus choledochus, the dilatation gradually extends over the entire apparatus; but it must be observed that the dilatation of the gall-bladder does not in general correspond with the dilatation of the other portions, as its efferent duct (ductus cysticus), from opening into the common duct at an acute angle, is compressed by the enlarged ductus choledochus. The more completely the caliber is obstructed, the more complete is the capillary distension; the more rapidly it ensues, so as not unfrequently to induce rupture.

The ductus choledochus is either found compressed by disorganized, and especially by cancerous, lymphatic glands, or by the pancreas, or the passage is narrowed by the tumefied mucous membrane or by the tumefied valve, or it is closed up by a biliary calculus or a carcinomatous tumour from without. Occasionally it is so enormously dilated as to exceed the diameter of the small intestine; the slower this effect is produced, the more marked will be its active character; and the distension extends upwards, passing by the gall-bladder, as above observed, to the hepatic duct and its ramifications.

The channel of the ductus cysticus is found impaired by unusual flexures, or large and numerous mucous folds, consequent upon previous elongation and distension, by cicatrices and cancerous degeneration; it may become perfectly obliterated by the same means, or by biliary calculi, which are impacted in the neck, and more particularly in a lateral dilatation of the gall-bladder. Enormous dilatations of the latter result, which in the course of time induce an entire change in the tissue and the functions of the mucous membrane of the gall-bladder.

After this occlusion has been rendered complete, the residuary bile in the gall-bladder is absorbed; the mucous membrane secretes mucus more copiously, in proportion to the irritation exerted upon it by the stagnating mucus left after the removal of the specific contents of the bladder. The secretion gradually accumulating, the gall-bladder extends, and its mucous membrane becomes converted into a serous membrane, which secretes a serous, albuminous fluid, resembling synovia; this is at first opaque, and subsequently becomes clear, and we detect in it, with the assistance of the microscope, nothing but solitary flocculi of pigmentary matter, and a few crystals of biliary fat. This affection of the gall-bladder is termed hydrops cystidis felleæ, and the bladder resembles the sound of fishes, being converted into a tense capsule,—a condition similar to that developed under analogous circumstances in the fallopian tubes, the ureters, the pelves and calices of the kidneys, and even in the vermiform process.

The new lining membrane of the gall-bladder is subject to all the diseases to which serous membranes and their cavities are liable; inflammations occur very frequently, giving rise to the most various exudations, and terminations as various. Among the latter, we allude especially to shrivelling of the gall-bladder, accompanied by diminution of its contents. These become inspissated, so as to form an adipose chalky pulp, or chalky concretion, with a subsequent ossification of the parietes.

The dilatation of the biliary ducts in the interior of the liver is either uniform, and affects the entire organ or certain portions only, or it occurs as a partial saccular dilatation of one or more of those ducts. In the former case the cause is generally to be found in an obturation of the biliary channels within or external to the liver, by means of concretions, cancerous growths, or croupy exudation; and the dilatation very frequently extends from the ductus choledochus to the biliary passages within the liver. In well-marked cases the entire capillary network belonging to this apparatus is dilated and gorged with bile; the parenchyma of the liver may be saturated with bile, and present a dark yellow or green colour; the viscus is turgid, though pulpy and friable, resembling the condition of yellow atrophy; the larger ducts contain bile in a disorganized state, and not unfrequently blood in a similar condition.

This affection invariably proves fatal with symptoms of biliary infection of the blood, and consequent cerebral disease, which is often combined with exudation on the arachnoid, with intense icterus and extreme pain in the liver. The capillary ducts are occasionally ruptured, and this gives rise to larger or smaller accumulations of bile in the deep-seated portions of the organ; or the rupture may occur in the peripheral layers, at spots where patches of dilated gall-ducts form rounded, fluctuating projections on the surface of the organ; in this case the hepatic peritoneum frequently becomes involved, and extravasation may take place into the abdominal cavity. Finally, the bile that transudes through the coats of the gall-ducts may, if it reaches the peritoneum, induce peritonitis, which in its turn predisposes to rupture of the serous covering investing the approaching biliary abscess.

The second or saccular form of dilatation of the biliary ducts is generally the result of a catarrhal or blennorrhoic condition. Capsules varying in size from a pin's head to a hen's egg, with a loose mucous lining that forms valvular folds, are found scattered through the liver, and they contain a liquid consisting of blennorrhoic or purulent mucus and bile, which deposits a sediment or incrustations. The character of the investing membranes affords a sufficient distinction from other cavities containing a similar fluid; but the afferent and efferent canal is not easily discoverable, even with the assistance of injections. These dilatations undoubtedly originate in an accumulation of catarrhal secretion, and are generally accompanied by a dull pain in the liver.

Contraction of the biliary passages is induced by the above-mentioned circumstances, and may advance to adhesion and obliteration, as is especially the case in the gall-bladder.

§ 3. *Anomalies in the Form and Disposition of the Biliary Passages.*—Among these we reckon the various congenital malformations of the gall-bladder, in which it presents an intestinal, cylindrical, extended, twisted, pyriform, or phial-shaped appearance, or in which it seems divided longitudinally or transversely, owing to a rigid condition of the internal folds. To this class also belongs the anomalous insertion of the ductus choledochus into the duodenum or stomach. The acquired malformations consist in contraction, obliteration, or dilatation of the gall-bladder; in change of position of the biliary passages, owing to pressure exerted upon them by enlarged lymphatics, morbid growths, &c.

§ 4. *Solutions of Continuity.*—We regard as peculiarly interesting the spontaneous ruptures occurring in the biliary passages external and internal to the liver as a consequence of excessive dilatation, which is generally preceded or accompanied by inflammatory action. We have also to cite the perforations of the biliary passages external to the liver, resulting from suppuration of their coats, and the abnormal passages subsequently established between the biliary ducts and the stomach and intestinal canal; as well as certain abscesses produced by suppuration of the capillary gall-ducts within the liver, of which we shall have occasion to speak more fully in the sequel. (See Textural Diseases of the Biliary Passages.)

§ 5. *Textural Diseases. a. Inflammation.*—We often observe catarrhal inflammation occurring in the biliary passages, with various terminations and results. Like catarrhs of other mucous membranes, it not unfrequently is a primary affection, and becomes chronic, or it as often is propagated from the intestine to the gall-ducts; but it often evidently has its origin in the irritation caused by an accumulation or an alteration in the composition of the bile, and especially by biliary calculi. At the bedside the affection is undoubtedly often mistaken for irritation and inflammation of the hepatic parenchyma.

Owing to the paralytic state induced in the contractile and irritable layer of their coats, and to the accumulation of bile, the gall-ducts become distended, their mucous membrane relaxed and tumid, and the muscular coat hypertrophied; within the liver saccular dilatations are formed; the catarrhal disease induces a stagnation of bile, which gives rise to calculous concretions, and occasionally suppuration and perforation of the gall-ducts follow. In the range of the biliary capillaries it most probably causes, in the manner just described, the formation of peculiar accumulations (abscesses), which are remarkable for the blennorrhoic pus and the bile they contain, and are thus distinguished from the products of parenchymatous inflammation of the liver.

Inflammation originating in irritation, caused by biliary calculi, deserves a special consideration, on account of its terminations and its consequences; it occurs chiefly in the gall-bladder. Occasionally, and particularly when brought on by an accumulation of bile from obturation of the neck of the bladder or of the ductus cysticus, it runs a very rapid course, attacking the submucous tissue of the gall-bladder, and terminating in rupture and effusion of its contents into the peritoneal cavity. At other times it proceeds more slowly, and, after repeated relapses, induces suppuration and ulcerative perforation of the gall-bladder. The latter is most liable to occur at the dependent portion, which is chiefly exposed to irritation, viz. the fundus of the bladder; and as previous peritoneal exudation will have agglutinated it to adjoining viscera, the suppuration extends to them, giving rise to abscesses in the liver itself above the gall-bladder, or in the lesser omentum; or establishing fistulous passages through the abdominal parietes, or communications between the gall-bladder and the pylorus, the duodenum and the transverse colon. Lastly, in favorable cases, the coats of the gall-bladder may be converted into a fibrous, callous tissue; its contents are discharged by the normal or by the above-described anomalous passages, and the organ represents a thick-coated, hollow capsule, with or without cicatrices on its inner surface, and containing, according to the condition of the mucous membrane, a mucous or serous fluid, and not unfrequently one or more calculi. This is the so-called obliteration or atrophy of the gall-bladder. The calculous inflammations of the biliary passages are followed, though less frequently, by similar results, viz. rupture, suppuration, gangrenous perforation, callous induration, and obliteration.

b. Croupy inflammation is of very rare occurrence. We have observed it in the mucous membrane of the gall-ducts in the liver, accompanying cholera-typhus and ileo-typhus. It gives rise to tubular exudations, in which the bile forms branched concretions which block up the passages, and thus cause dilatation of the capillary gall-ducts.

We have already noticed the occurrence of the secondary and gangrenous typhous process on the mucous membrane of the gall-bladder.

c. Œdema of the coats of the gall-bladder.—Serous infiltration of the coats of the gall-bladder occurs in general dropsy, and especially in ascites, and also in the shape of subserous infiltration in inflammation of the peritoneum.

d. Adipose deposits in the coats of the gall-bladder.—An excessive deposit of fat under the peritoneal investment of the gall-bladder only occurs as an accompaniment of general adipose accumulation, or at least of accumulation of fat in the abdomen. Its occurrence is of some interest, inasmuch as, like the fatty deposit in the heart, it is likely to induce fatty degeneration of the muscular layer.

§ 6. *Adventitious Products.* *a. Fibroid tissue.*—Under this head we class the textural alteration occurring in atrophy of the gall-bladder after inflammation.

b. Anomalous osseous deposit—ossification, as elsewhere in mucous canals, takes place only as a consequence of previous textural alteration of another kind. Thus we find subserous osseous lamellæ formed in the parietes of the gall-bladder, after it has been converted into a sero-fibrous capsule, in hydrops cystidis; or the fibroid tissue which is developed in the parietes of the gall-bladder, as a consequence of inflammation and partial suppuration, may ossify.

c. Tubercular deposit in the biliary passages is of very rare occurrence.

d. Carcinoma of the biliary passages is chiefly met with as a complication of cancer of the liver, but also of the lumbar lymphatic glands, and of the stomach. It occurs either as an idiopathic nodulated deposit in the submucous tissue, in rare cases giving rise to annular stricture and degeneration of the entire bladder into a cancerous capsule, or as cancerous infiltration of the mucous membrane; or, as is more commonly the case, the biliary passages are attacked from without, cancerous growths in the vicinity perforate the parietes, and push their way into the cavity. The gall-bladder is most frequently attacked by hepatic cancer; the ductus choledochus by carcinoma of the lymphatic glands. Obturation of the passages and hemorrhage are common consequences of the affection.

§ 7. *Anomalous Contents of the Biliary Passages.*—The most remarkable are those entirely abnormal contents of the biliary passages, which are either the product of textural changes and morbid processes in their coats, or which, after being generated externally, are conveyed into the cavity by various passages. We allude to the sero-albuminous fluid of dropsy of the bladder, to mucus, to pus that has been formed in the biliary passages, or in hepatic abscesses, to blood derived from cancerous growths, to acephalocysts from the liver, lumbrici from the intestine, &c.

The bile itself presents great varieties as to quantity, but more still as to quality; in the majority of instances the anomaly has its origin not so much in disease of the liver, as in morbid conditions of other organs, especially of the intestine and of the portal blood.

As regards quantity, the bile is found accumulated to a large amount in the biliary passages and intestine, or it is remarkably scanty. It is to be observed that in the latter case the deficiency is sometimes compensated by the saturated condition of the fluid.

The qualitative anomalies of the bile are more numerous and important, and affect both its physical and its chemical constitution.

The colour of the bile varies extremely: it may be pale yellow, ochrey, orange-coloured, yellowish-brown, blackish-brown, black, or of all the different shades and tints of green. The consistency of the bile generally increases in a ratio with the increased depth of colour, varying from the fluidity of water to the density of tar and of calculous concretions. In taste it varies as to the amount of bitterness, but it may also be more or less, or entirely, saccharine, saline, sour, alkaline, acrid, or insipid.

In reference to its chemical constitution, the bile presents, as might be inferred from its physical qualities, numerous deviations from the correct standard; the chief constituents vary in their relative proportions, or they are replaced by new anomalous substances.

The biliary calculi are of considerable importance. They originate in a morbid constitution of the bile, which may be abnormal when secreted, or subsequently become so from stagnation and retention. They occur in the biliary passages external to and within the liver, but more especially in the gall-bladder.

Here too we find numerous variations with regard both to physical qualities and to chemical composition.

They vary in size from a millet seed to a hen's egg, and more. We generally find the largest to be formed by several materials disposed in layers, with a preponderance of fatty matter. The larger they are, the less numerous will they be; sometimes several hundreds of small calculi are discovered in the gall-bladder.

Their form and surface vary much. Single calculi are commonly round, oval, or cylindrical; when very large, so as to occupy the entire cavity of the gall-bladder, they are frequently slightly curved; if several are present at the same time, they mutually prevent their enlargement, and in consequence of the friction and pressure they exert upon one another, they assume cubical, tetrahedric, prismatic, or irregularly polyhedric shapes, with convex or concave surfaces.

The calculi found in the ducts are generally cylindrical, occasionally branched, or entirely amorphous. Their surface may be smooth and unctuous to the touch, or rough, racemose, uneven, of a mulberry appearance, crystalline, or branched.

The texture of the calculi may be uniform or varied, in proportion as they consist of one substance, or of several layers. Many show no distinct arrangement; some have an earthy pulverulent fracture, or a fibrous, striated, laminated, micaceous texture, presenting a glassy, silky, or asbest-like gloss on fracture, as is particularly observed in calculi consisting of cholesterine.

Generally speaking, they are not very hard, and may, when first removed from the body, be easily compressed between the fingers. On drying, they crack and fall to pieces, and at last become pulverulent, which is particularly the case with those concretions which consist of inspissated bile or biliary resin.

In colour they vary considerably; they may be milk-white, blueish, chalky, light or dark yellow, brown, black, or colourless, or transparent, with a slight yellow or green tinge. Those of an ochrey, red, green and blue (bronzed) colour are unusual. Sometimes we find them spotted, and either of a uniform colour throughout, or varying in layers, or at least containing a differently coloured nucleus.

Chemical analysis shows the biliary calculi to consist mainly of inspissated bile, biliary resin, colouring and fatty matter, and the calculus may be either formed of one of these substances or of a mixture of several. In the latter instance they either interpenetrate one another, or are disposed in distinct layers, which are distinguishable by their colour or texture.

Large biliary calculi generally contain but a small portion of inspissated bile; the latter often forms small irregular concretions in the gall-bladder, or larger cylindrical and branched concretions in the gall-ducts, or it serves as a nucleus to the various calculi of the gall-bladder. The resin and pigmentary matter of the bile enter into the composition of the majority of gall-stones, and that frequently to a considerable extent.

Cholesterine almost always preponderates; it frequently occurs in a pure state as a white, mother-of-pearl like, shining, or opaque fatty investment, or in distinct layers of a striated texture, which are separated by coloured resinous layers; it may also exist in an isolated form, deposited round a coloured nucleus, and give rise to translucent calculi of a striated and distinctly crystalline texture. In the latter case we generally find that small solitary calculi, in the former very large calculi, result.

Picromel commonly occurs but in minute quantities, in biliary calculi; the various salts they contain form but a small proportion compared to the amount of the above-named constituents. Those concretions in the gall-ducts which are found to consist of carbonate of lime, are not products of the bile, but of the blennorrhoic mucus and pus of the gall-bladder.

The calculi found in the same gall-bladder generally resemble one another in composition, shape and size; although we meet with occasional exceptions from this rule. Thus in dropsy of the gall-bladder, we often find, beside the calculus which closes up the cystic duct, and which is of an old date, and of complicated structure, a second crystalline calculus, of more recent formation, which consists of pure cholesterine.

The calculi are either unattached or sessile. In the latter case they may be grasped and retained by a portion of the bladder, or be agglutinated to its internal surface by exudation, or they may be included in compartments, formed by an inspissated albuminous product of the gall-bladder, or by organized lymph which has been converted into fibrous tissue. Small calculi are also occasionally formed within small saccular dilatations of the biliary mucous membrane, and may appear to lie external to the cavity of the bladder.

Biliary calculi frequently cause irritation, inflammation, and subsequent suppuration of the coats of the gall-bladder, which may terminate in various ways. Cicatrices are often left, which more or less diminish the cavity. They may induce complete occlusion of the biliary passages, followed by dilatation and retention of bile. We must, however, observe that sometimes, owing to the extreme distension which the biliary passages are capable of, calculi of the size of a hen's egg are enabled to pass.

Biliary calculi are of common occurrence. We have observed that their formation is peculiarly coincident with excessive deposit of adipose tissue and with carcinoma.

The entozoa occurring in the human gall-bladder are the endogenous acephalocyst of the hepatic parenchyma and the distoma hepaticum.

SECTION III.—ABNORMAL CONDITIONS OF THE SPLEEN.

§ 1. *Defect and Excess of Formation.*—The spleen is generally absent in acephalous monsters, together with other organs of the abdomen and thorax. Occasionally it is found wanting, together with the stomach or the fundus of the stomach, in subjects that are otherwise well developed, or it exists in a rudimentary state, whilst the stomach is in a normal condition. The explanation of these phenomena is to be sought in the history of the development of the embryo.

The spleen is found double in biventral monstrosities. The multiplication of the spleen, in the shape of lienes succenturiati, is not to be viewed as an increase, but as a subdivision of the organ, which does not affect its individuality. We not unfrequently find, besides the main organ, small accessory spleens (lienes succenturiati) seated in the omentum and ligamentum gastrolienale. They vary in size from that of a millet seed to that of a walnut, and in number from one to twenty. They are round, present the same structure as the spleen, and are morbidly affected at the same time, and in a similar manner as the latter. The marginal indentations of the spleen, or the complete separation of a portion of the organ by an horizontal fissure, form transitions to this abnormal condition.

§ 2. *Deviations of Size.*—Deviations of size consist either in an abnormal increase or diminution of the organ. The former is of particular importance, and those tumours afford a special interest, which depend upon congestion caused not by mechanical impediments, but by the peculiar relation of a morbid state of the blood to the spleen. With the rare exceptions of those cases in which, like analogous states of the liver, they are congenital, these conditions are acquired. They are either acute or chronic: in the former case they accompany other acute diseases, either during their entire course, or only during single stages; in the latter, the tumefaction results from dyscrasiæ or cachectic conditions, which induce congestion, induration, and hypertrophy of the spleen. These terms, however, from referring mainly to external appearances, are apt to cause the real nature of the disease to be overlooked.

It is unnecessary to enter more fully into the consideration of these changes affecting the splenic parenchyma, which are evidenced by tumefaction, as it will be more appropriate to treat the subject under the head of textural diseases. We merely add the following remarks:

a. Acute tumefaction is generally accompanied by considerable softening of the splenic parenchyma; chronic tumefaction by increase in the consistency of the organ. It is questionable whether the hypertrophy affects the elementary tissue and constitution of the spleen; this is a point which requires to be elucidated by further research; but there is no doubt of the fibrous trabeculæ of the spleen and its fibrous capsule becoming hypertrophied in old chronic tumours. When we have succeeded in reducing an acute or chronic tumour, or even a mere hyperæmic state of the spleen, we often find the sheath of the spleen thickened, opaque, corrugated, and relaxed after death —a fact which may serve as a useful indication.

b. The size attained by chronic tumours of the spleen is often very considerable. The spleen not unfrequently measures sixteen inches in its long, seven inches in its short diameter, and four inches in thickness; its weight may amount to thirteen pounds and a quarter, and, according to the observations of others, even to twenty and more pounds.

Diminution of the spleen is characterised by shrivelling of the fibrous tissue, which prevents the vessels from being injected; and is peculiar to genuine cholera (cholera algida), or it occurs as atrophy, in consequence of a special change in the fluids at large. Under this head we must class numerous obscure cases of permanent diminution of the spleen in individuals who in no way resemble each other, of the reduction of the spleen observed by some pathologists as resulting from the use of steel, and of the senile involution of the spleen.

Atrophy varies in degree; it occasionally advances to such an extent during the involution of the organ, as to reduce it to the size of a hen's egg or walnut.

The spleen in these cases is paler than usual, its consistency is increased or diminished, the organ may assume the toughness of leather, or become soft, friable, and pultaceous. Senile atrophy may be characterised in the following manner: the spleen is considerably reduced in size, and flabby; its sheath is opaque, corrugated and thickened, but at the same time softened and easily ruptured; the parenchyma consists of a pulp which is of the colour of rust or the lees of wine, and which is enclosed in dense and equally friable, fibrous tissue. We not unfrequently find the sheath of the spleen indurated and cartilaginous, or ossified, and at the same time, ossification of the arterial ramifications and free calcareous concretions (phlebolithes) in the veins of the organ.

§ 3. *Deviations of Form.*—We not unfrequently meet with a tongue- or platter-shaped, almost cylindrical, globular, or angular spleen; its edges may be more or less notched, which is particularly the case with the anterior margin; and the indentation may extend so far as to cause a transverse division of the organ. These furrows are not to be confounded with the contractions that are occasionally produced by inflammation and metastasis, and which very much resemble the former.

§ 4. *Deviations of Position.*—The congenital anomalies that come under this head consist in the spleen occupying a place external to the abdominal cavity, when the latter is fissured, in its being placed in large umbilical herniæ, and in the left thoracic cavity when the diaphragm is absent, and in a varying position, consequent upon an anomalous congenital elongation of the peritoneal attachments.

Acquired deviations of position consist in a descent of the spleen, when forced down by enlargement of the left side of the thorax, or in its being pushed up by dropsical and ascitic accumulations, or by a tympanitic state of the intestine; in its dislocation by various tumours, or in its descent from increase in size and weight. Enlarged spleens sink vertically into the left mesogastric region, or raise the diaphragm, or they descend to the ileum, and in the case of a still further increase of size, slide off from the latter, so as to occupy a diagonal position in the hypogastrium, and extend over the right ileum. There is no doubt that the spleen occasionally presents very loose attachments, and remains freely moveable, even after it has been reduced from an hypertrophied state to its normal size, in consequence of the previous traction exerted upon its ligaments.

§ 5. *Solutions of Continuity.*—Under this head we class injuries of the spleen inflicted by cutting instruments, rupture consequent upon blows or knocks received in the region of the spleen, contusions, as in being run over, concussions, as in a fall, and spontaneous ruptures. The latter are of peculiar interest, as they are the result of acute and violent tumefaction of the organ, proceeding to a most intense degree. We are able to confirm the fact observed by other authors, of the occurrence of spontaneous rupture in typhus, in typhoid cholera, and in the hot stage of ague, and the consequent fatal termination from hemorrhage.

§ 6. *Diseases of Texture.*—The chief diseases that appertain to this class, the hyperæmiæ, the so-called infarction and hypertrophy, and inflammation of the spleen, require, in order to be duly appreciated, not only anatomical proof of the existence of the disease, based upon a clear notion of the structure of the organ, but more especially an advance in our knowledge of the pathology of the blood and the serum. Numerous diseases, and more particularly the simplest derangements, as many cases of hyperæmia, can only be elucidated by attending to these points. These diseases of the spleen are probably but rarely idiopathic; they almost always arise from certain anomalies of the blood and the serum, or from certain dyscrasiæ, which, though little known, and as little understood, bear a remarkable and positive relation to the spleen. The spleen may in fact be considered as the most sensitive test for a variety of dyscrasic states of the fluids. An acquaintance with this connexion may serve to lift the veil which still conceals the true function of this organ. We shall now resume the consideration of tumefaction of the spleen, upon the basis of the above remarks, and enter into a more minute investigation of the subject than we could adopt in the previous general outline. The main points relating to deviations of consistency will at the same time be adverted to.

1. *Hyperæmia, anæmia.*—Hyperæmia of the spleen arises either from a mechanical impediment in the circulation of the blood, or from the peculiar relation alluded to as existing between the spleen and certain anomalous conditions in the fluids.

The first variety occurs in organic diseases of the heart and in hepatic obstructions, though not, especially in the former, to the extent, nor as frequently, as might be expected from obstacles or stasis affecting the entire system of the vena cava and venæ portæ. The deranged circulating fluid appears to have no affinity for the tissue of the spleen, and to be thus in part carried off, and in part mechanically retained. This latter portion, in the first instance, induces an hyperæmic turgor of the organ, and gives it a dark red colour, and subsequently, as is generally the case in these hyperæmiæ, induces hypertrophy of the fibrous tissue and of the pulpy parenchyma of the spleen. The organ is more consistent, indurated, and dense.

The second form accompanies various dyscrasic conditions of the fluids, and in proportion to their duration induces an acute or chronic tumour of the spleen, which differs in appearance, and in its primary and secondary constitution, according to the nature of the cause.

The hyperæmiæ affecting the peripheral portion of the organ not unfrequently degenerates into inflammation of the peritoneal investment of the spleen; the resulting exudations are converted into the cellular, cellulo-fibrous, or cartilaginous tissues and adhesions so often found upon spleens that have formerly been tumefied.

Anæmia of the spleen occurs in connexion with the above-mentioned reductions in size.

2. *Tumours of the spleen.*—We have already discussed the tumours of the spleen arising slowly or rapidly from hyperæmia, and from the congestion of dyscrasic blood, as far as regards the mere increase of volume. We have now to examine them more closely in other points of view.

These tumours are observed in typhus, and in many typhoid states, as in cholera typhus, in pyæmia, and in anomalous exanthematic processes, as occurring from disorganization of the blood after erysipelas, scarlatina, miliaria, or rheumatism, as found in drunkards, and in acute tubercular affections; they occur as a result of suppressed menstrual or hemorrhoidal discharge, of intermittent fever, of rickets, of lues and mercurial cachexia, and of many dyscrasic tubercular affections.

These tumours differ in character, and are owing partly to the hyperæmia, partly to the deposition of an anomalous fibrous product in the parenchyma of the spleen. We find the greatest difference in the consistence of the tumours; but the chronic indurated tumours are undoubtedly soft at first, and subsequently attain greater hardness, according as the deposit is more or less coagulable. The same remark applies to the colour of the tumour, which at first is undoubtedly red, but subsequently becomes paler in proportion as the colouring matter is absorbed, and the hyperæmia is forced to yield to the compression exerted upon it by the deposit. We find, as regards other qualities, that the morbid product offers very prominent varieties, which we will examine in the analysis of the chief tumours that follows; the finer, though not less different, characters we leave to another department of science which, though not yet cultivated, promises many and very important results.

a. Among the tumours which accompany acute diseases of the blood, those of typhus are distinguished by their rapid and extensive increase, by their lax tissue, both of which circumstances sometimes predispose to rupture, and by the dark red colour of the parenchyma. This variety originates in stasis affecting the vascular system of the fundus ventriculi, and in the deposition of a very lax, pultaceous, semi-fluid, blackish-red, dirty violet, or lighter coloured purplish mass, varying in amount, and resembling the pulpy medullary matter found in the typhous mesenteric gland. If this substance is deposited rapidly to a large amount, the fibrous trabeculæ of the spleen are rendered soft and friable by extension; and if the deposit is very soft, the viscus presents fluctuation.

The tumours occurring in the other acute dyscrasiæ above alluded to, are more or less allied to this one. When accompanying universal acute tuberculosis, the eliminated mass, partially at least, at once assumes the characters of tubercle. The spleen may increase from a slight enlargement to three, four, five, and six times its normal size.

Tumours occurring after suppression of the above-mentioned hemorrhages do not generally become a subject of anatomical research until they have attained a very considerable size. They are most probably the result of repeated typical (typische) hyperæmiæ, and would be found at their commencement to be of slight consistency, and of a red colour. A coagulable fibrinous deposit, however, takes place, and the tumour therefore, in proportion to the amount of coagulation, becomes hard, elastic, and indurated, the parenchyma is reddish-brown, of the colour of fresh muscle, and presents on section a fleshy (sarcomatous) appearance; by degrees the colouring matter is absorbed, the organ then presents a pale red, yellowish, or reddish-white appearance, and resembles fibrine that has been washed. During the hyperæmiæ the fibrous trabeculæ also increase in quantity and toughness, so that the tumour becomes more resistent; the fibro-serous capsule is also rendered more opaque, and is thickened; it is invested with a cellular pseudo-membrane, resulting from peritoneal inflammation, and is thus attached to the abdominal parietes. The deposit gradually increases to such an extent as to induce a compression of the vascular portion of the spleen, and to render it impermeable to injections; for the same reason, the tumour gradually becomes paler, and a vicarious development of the vessels at the fundus of the stomach ensues.

The third variety of splenic tumours bears a general affinity to those accompanying the above-named cachexiæ, but the deposit that occurs in them and is substituted for the parenchyma of the organ much resembles bacon in consistency and appearance; the organ on section offers a very smooth surface, a dull, lardaceous (speckig, baconny), waxy gloss, and its superficial layer appears partially transparent, the spleen is hard, but breaks with a peculiar fracture; it presents a colour varying from dark purple to pale red, and the blood contained in the vessels is pale and serous; this variety of splenic tumour is often coincident with the analogous lardaceous infiltration of the liver (vide p. 121); it may, however, occur in an isolated form, or complicated with a similar affection of the kidneys (a variety of Bright's disease). Like the other varieties, this tumour may attain an extreme size, and dropsy, and especially ascites, are common results.

b. We have lastly to advert to the fact that many cases of swelled spleen depend upon the formation of certain corpuscles, in addition to the coexisting hyperæmia. These small bodies are quite distinct from the Malpighian corpuscles, found in the spleens of some graminivora; they are minute grayish-red, or grayish-white, opaque, soft, deliquescent, vesicular substances, of the size of a millet seed, which occupy the parenchyma of the spleen. They accompany a morbid development of the abdominal lymphatics, and especially of the follicular apparatus of the intestinal mucous membrane, with turgescence of the mesenteric glands, occurring in those affections of children and young subjects, which we have spoken of at page 66; they are also found in typhous affections of these organs, and of the spleen, and indicate a predominance and qualitative derangement of the lymphatic system. They are consequently also found complicated with acute and chronic tumours of the spleen, and are not to be confounded with acute tuberculosis of that organ.

The consistency of the spleen, as may be gathered from the above remarks, depends almost entirely upon the state of aggregation of the parenchyma, or of the morbid product which has replaced the latter. The condition of the fibrous tissue also influences it to a certain extent, but it varies much even within the limits of its physiological condition. The two extremes constitute softening and induration of the spleen, which we have already examined in their strict sense.

In very rare cases, the black softening of the tissues of the fundus ventriculi is accompanied by a similar affection of the splenic tissue, which is converted into a black, carbonaceous, tarry, semi-fluid mass, originating in the vascular system.

3. *Inflammation of the spleen.*—The very important conclusions to be derived from pathological anatomy in reference to inflammation of this organ, and with regard to its influence upon sanguification, will be self-evident.

We cannot doubt that the pulpy substance of the spleen may be the original seat of inflammatory action; the fact has not, however, been as yet anatomically demonstrated; in the same manner it is not improbable, though by no means proved, that many acute and chronic tumours of the spleen may be the product of inflammation.

The variety of inflammation for which pathological anatomy affords an explanation is, to name it from its seat, phlebitis, i. e. an inflammation of the numerous anastomosing and tortuous venous canals of the spleen. In fact, we have only to apply the doctrines promulgated with regard to inflammation of a vein to a venous ganglion, in order to obtain a correct picture of inflammation of the spleen; that which elsewhere takes place in a simple vascular tube is here found in a complicated venous apparatus.

This inflammation of the spleen occurs as a primary or as a secondary affection. Whilst the former is as rare as spontaneous primary inflammation of a vein, the latter is as frequent as secondary phlebitis.

Primary inflammation of the spleen, if not early combated, or unless ending in resolution, gives rise to an exudation of laudable pus or fibrine. In either case the circulating fluid may become infected, and coagulation be produced in the most various regions of the vascular, and especially in the capillary system. This is an explanation of so-called metastases. However this is unusual in the case of fibrinous exudation, as the inflamed vessels are closed by the coagula, causing obliteration and subsequent conversion of the inflamed part of the spleen into a fibro-cellular callus, which may even ossify.

In the case of purulent exudation, inflammation of the spleen passes into suppuration, and abscesses form. In a favorable case, the abscess may be circumscribed by adhesive inflammation, and, being inclosed in a sac formed by obliterated parenchyma, which has been converted into fibrous tissue, may be borne for a long period; a partial absorption of the pus may take place, and the remainder becoming inspissated be reduced to a calcareous greasy pulp, or even to a hard concretion. The more common case is that the parietes of the abscess also put on inflammatory action, and suppurate, in consequence of which the abscess generally enlarges very rapidly, with symptoms of violent and universal reaction in the shape of hectic fever. We then have a case of florid (floride) splenic phthisis.

If the inflammation extends to the sheath of the spleen, inflammation of the splenic and neighbouring peritoneal surface ensues; an occurrence which is analogous to the communication of disease from an inflamed vessel to the tissues in its vicinity; the inflammation is not, however, apt to spread far.

The splenic abscess not unfrequently discharges,

Firstly, Into the abdominal cavity; the pus is then often inclosed by the product of circumscribed peritonitis, which causes the formation of a sac, bounded by the external wall of the abdomen and the diaphragm, the fundus ventriculi, the colon, and its mesentery; the entire spleen is thus occasionally destroyed by suppuration.

Secondly, Into the left thoracic cavity, after suppurative destruction of the diaphragm, or,

Thirdly, Into the cavity of the transverse colon, and into the stomach.

Secondary inflammation of the spleen is of frequent occurrence in all cases in which the blood is poisoned by the absorption of an inflammatory product, or has become affected in an analogous way spontaneously, a fact which indicates the delicate reaction of the spleen to a morbid condition of the blood. We then see the formation of inflammatory spots, which are in every way remarkable. They are well defined; they always occupy the peripheral portion of the organ, and generally present a cuneiform shape, the base being at the surface, the apex being directed towards the interior; there are often two, three, four, and more of these foci present at the same time; they vary in size from that of a pea, to that of a hen's egg, and in rare cases involve an entire third of the viscus.

The substance of the spleen appears considerably darker at these spots, from the commencement, and also denser and more resistent; it subsequently assumes a reddish-brown colour, and its density also increases, so that the affection may be at once identified, even externally; its limits are now well defined, and reactive inflammation is set up in the adjoining tissue. The process may terminate in various ways; in favorable cases, especially when a benignant fibrinous exudation has been absorbed into the blood, as frequently occurs in inflammation of the internal membrane of the blood-vessels, and particularly of the endocardium, the diseased tissue is converted into a cellulo-fibrous callus, which contracts and causes a cicatrix at the surface, by drawing the sheath of the spleen inwards. The more common case is that pus or ichorous matter is absorbed, and that the inflamed portion is converted into a puriform, creamy mass, or into a sanious, greenish, greenish-brown, or chocolate-coloured pulp; in the latter instance, the conversion is often effected with very violent symptoms, without previous induction of the paleness above described.

The entire process is a detailed repetition of that occurring in secondary phlebitis, and is nothing more than the metamorphosis of an infected coagulum within the channels of a vascular ganglion.

When the disease affects the peripheral portions of the organ, peritonitis frequently supervenes, and an eschar having formed in the sero-fibrous sheath, a discharge into the abdominal cavity is not rarely effected.

This secondary inflammation of the spleen is a very frequent complication of inflammation of the internal vascular coat, and and particularly of endocarditis. Of all organs that are affected in a similar manner, by the absorption of a product of inflammation into the blood, the spleen is the most liable to be attacked. When occurring as a result of spontaneous disorganization of the blood, it is particularly important in complication with croup, as also with exudative processes on mucous and serous membranes, particularly with pneumonia, and, lastly, with the analogous process of tubercular disease.

4. *Gangrene of the spleen.*—Gangrene is as rare an occurrence in the spleen as in the liver; we have had an opportunity of observing it once in a chronic tumour of the spleen, affecting the organ to a considerable extent.

5. *Adventitious growths. a. Anomalous, fibrous, and fibro-cartilaginous tissue.*—This tissue occurs—

α, Very often upon the surface of the organ underneath its peritoneal sheath, in the shape of smooth and level, or tuberculated plates of varying thickness and size. It occurs in this shape at advanced periods of life, as a result of the congestion to which the parenchyma and the investment of the organ have been exposed. It is not very unusual to find these laminæ of such an extent as to invest the entire convexity of the spleen, and to present a thickness of several (two, three, and five) lines.

β, It occurs very rarely in the shape of fibroid tumours of the parenchyma of the spleen.

b. Anomalous osseous growths.—We find them occurring—

α, As ossification of the fibroid laminæ just described, of the same extent and thickness as the latter; they are rarely found except in very old people;

β, As cretified fibrine in the cellulo-fibrous callus, subsequent to primary and secondary inflammation of the spleen;

γ, As round unattached concretions, or phlebolithes, in the venous channels of the spleen.

c. Formation of cysts.—Encysted tumours of the spleen are very remarkable, and as unusual as cancer, a fact which is interesting on account of the contrast with the frequency of tubercle. The acephalocyst is either found in the spleen alone, or concurrently with one in the liver; it rarely attains the size it reaches in the latter organ, but is otherwise not distinguished by any peculiarity. Cysts with other contents are still less frequent.

d. Tubercle.—Tubercular disease affects the spleen only less frequently than the lungs and the lymphatic glands. It always characterises an advanced stage of tuberculosis, which had previously only appeared as chronic disease in some other organ, as the lungs, the brain, or the lymphatic glands, or had merely existed in a latent form, and is now converted into acute general tuberculosis. Splenic tubercle is consequently always complicated with tubercle in the most various organs, and very frequently with universal tubercular deposit.

Tubercle of the spleen, when acute, commonly appears in the shape of numerous densely-sown granulations of the size of a pin's head or millet seed, resembling gray transparent vesicles, or of an opaque white colour; or as yellow cheesy masses, varying in size from a millet seed to a pea. When chronic, it presents the shape of crude, originally gray, granulations of the size of a millet or hemp seed, which subsequently are converted into a cheesy substance.

The parenchyma of the spleen is the seat of tubercle; we not unfrequently find a small central cavity within the tubercle, and the latter is occasionally surrounded by a cyst or capsule of fibro-lardaceous texture, a fact which demands special investigations for its elucidation.

For the same reasons that apply to hepatic tubercle, tubercle of the spleen scarcely ever passes beyond the stage of commencing ramollissement.

The spleen appears swollen in proportion to the quantity, and also to the size of the tubercles; in acute tuberculosis its turgescence and the relaxation of its parenchyma strongly resemble the typhous condition.

e. Cancer.—Cancer occurs very rarely; we have as yet only met with the medullary variety in combination with cancer of other organs, especially of the liver and the lumbar glands. The structure of the spleen appears to afford a satisfactory explanation of the fact, that cancer occurring in it is frequently invested by a fibrous sheath, within which it passes into a state of ichorous solution. The sheath is formed by the displaced fibrous tissue of the spleen, which, in the case of the adventitious growth attaining a considerable size, is strengthened by the fibrous investment of the spleen.

SECT. IV.—ABNORMITIES OF THE PANCREAS, AND THE OTHER SALIVARY GLANDS.

We shall first examine the abnormities affecting the parenchyma of the above-named glands, and then proceed to examine those of their efferent ducts, and of their contents. We may observe, generally, that these organs are not very liable to become diseased.

§ 1. *Abnormities of the Pancreas and the Salivary Glands.*—1. *Defect and excess of formation.*—Absence of the pancreas and the salivary glands is only observed in very imperfect monstrosities; salivary glands sometimes present an arrest at a very low stage of development, inasmuch as they may be blended with one another and with the thymus and thyroid glands, so as to form one mass. Excess of development occurs very rarely in the shape of a double pancreas, or of an extravagant development of accessory appendages.

2. *Deviation in size.*—Enlargement of the above-named glands, in consequence of hypertrophy, is altogether unusual; but when it does occur it affects not so much the acini themselves, as the interstitial cellular tissue. The gland therefore almost invariably becomes more compact and drier, and then presents simple non-malignant induration.

A diminution of the pancreas is the result of atrophy. Occasionally, and particularly at an advanced age, this takes place spontaneously, or it may be induced, secondarily, by other anomalies, such as chronic inflammation and adipose infiltration, or the deposition of calcareous matter in the efferent ducts. The atrophic state is accompanied by variations of consistency, the organ sometimes presenting coriaceous tenacity, at others a lax and pultaceous condition.

3. *Deviations of consistency.*—We meet with the most various degrees of consistency in the pancreas. The two extremes only come within the range of pathology; they are on the one hand extreme cartilaginous dryness of the tissue, and induration which is generally coupled with enlargement; on the other extreme softening, relaxation, and succulence of the tissue.

4. *Diseases of the tissues.* *a. Inflammation.*—Inflammation of the salivary glands is either acute or chronic, and it is either primary or secondary; in the latter case it is metastatic. Inflammation of the pancreas, at all events in the acute form, is extremely rare: this is not the case with the other salivary glands, especially with the parotis; here the inflammation is very often primary, and still more frequently metastatic.

The acute form is characterised in the following manner: in the first instance there is tumefaction of the gland, reddening, congestion, relaxation, and succulence, i. e. infiltration of the interstitial cellular tissue; in the progress and in the higher stage of the disease, a sarcomatous condensation of the cellular tissue follows as a consequence of plastic exudation into its areolæ; the congestion and reddening attack the acini, which appear to be fused with the former, and the entire gland is enlarged and indurated. Unless the inflammation pass into resolution, small punctiform abscesses result, which enlarge, become more numerous and coalesce; the gland, and particularly the cellular tissue, is now found uniformly infiltrated with yellow pus, which exudes from it as from a sponge, whilst the acini appear as small, red, lax, friable corpuscles, which fuse at a later period; or suppuration is established at distinct spots so as to form an abscess, which may discharge itself in various directions, subsequent to the destruction of the adjacent tissues.

Chronic inflammation induces condensation, induration of the cellular tissue, obliteration of the acini, and either permanent enlargement or subsequent atrophy of the gland.

The metastatic forms of inflammation not unfrequently pass rapidly from the stage of hyperæmia with livid redness, into sanious ulceration, with sudden disappearance of the turgor.

b. Adventitious growths.—The salivary glands are not very subject to the formation of morbid growths; tubercle is never discovered in them, and carcinoma rarely attacks them primarily. We find the pancreas liable to—

α. Excessive accumulation of fat, which may terminate in a conversion of the entire organ into one mass of fat. This affection rarely occurs without a coincident accumulation of fat in the abdomen. The disease proceeds from without inwards, and in very obese persons a direct communication may be traced between the surrounding fat and the pancreas; the cellular tissue gradually absorbing the lax greasy fat, the acini, which are of a dirty-yellow colour, being reduced and gradually disappearing. When the disease has attained its extreme limits, a mere pultaceous strip of fat retaining the general outlines of the gland is found in its place; only scattered remains of the acini are discoverable, and in the delicate and thinned duct there is a whey-like fatty fluid. The disease occurs frequently in drunkards, associated with fatty liver and the formation of biliary calculi.

β. Cysts.—Serous cysts are occasionally formed in the pancreas, as well as in the other salivary glands. They are to be carefully distinguished from dilatations of the ducts and their terminations, which put on a similar appearance.

γ. Fibrous tissue, cartilaginous and osseous growths.—Tumours of this description occur but very rarely in the parotid.

δ. Carcinoma.—Carcinomatous disease occurs, in the pancreas and salivary glands, and especially in the parotid, in the shape of scirrhus and medullary cancer. In the parotid it sometimes appears as a primary disease; in the pancreas we have only found it, and even then exclusively at its duodenal end, as a complication of extensive carcinoma of numerous other organs. The secondary affection of the salivary glands by an extension of the disease from adjoining organs, and in the case of the pancreas especially, by an extension from the scirrhous pylorus, is very common. Cancer appears in the shape of infiltration of the interstitial cellular tissue of the gland or of nodes. Dr. Berg has, during his residence in Vienna, discovered carcinomatous induration of the entire pancreas in a new-born child.

§ 2. *Abnormities of the different Ducts and of their Contents.* —Next to salivary fistula subsequent upon injuries and ulcerative destruction of the tissues, which occurs chiefly at the ductus stenonianus, but which we have also seen in the shape of pancreatic fistula (see p. 34) discharging by a perforating ulcer of the stomach, we find dilatation of the excretory ducts and of the ductuli salivales to be the chief and most frequent affection that has to be noticed under this head.

Dilatation depends mainly upon retention and accumulation of the secretion, and may either affect the entire duct or one portion uniformly, or small detached points, so as to form saccular or varicose dilatations; in the latter case, again, the duct may present single fusiform or vesicular dilatations at intervals, or numerous closely-set expansions, which are partially separated from one another by valvular folds formed by the coats of the duct. The coats may be either considerably thickened or considerably attenuated.

The cause is generally to be found in some mechanical impediment, such as compression and complete obliteration of the duct external or internal to the gland by morbid growths of various descriptions. In the pancreatic duct it may be induced by gall-stones occupying the orifice of the ductus choledochus, by a sudden curve or angle of the duct brought on by cancerous induration and shrivelling of the normal tissue with change of position such as we often observe in the pancreatic duct near the head of the pancreas. It may be induced by tumefaction of the internal membrane, by a mucous plug, and especially by calcareous concretions (salivary calculi). In rare cases the dilatation of the pancreatic duct is, like that of the bronchi, brought on by induration and atrophy of the gland. In morbid softening of the gland, and especially in the adipose metamorphosis, the duct is deprived of its contractility, and dilatation with a marked attenuation, and relaxation of its parietes ensue; lastly, dilatations of the duct may take place without any mechanical obstruction, in consequence of scirrhoid disease of its duodenal end; the duct in this case fuses with the scirrhous portion of the gland; it is thus fixed, the scirrhus involves its tissue, whereby its vital contractility becomes impaired, and the secretion is allowed to stagnate in its cavity.

The dilatations of the pancreatic duct enlarge to the size of a goose's or swan's quill; the saccular expansions may reach the size of a hazel nut or pigeon's egg. In Wharton's duct the dilatation occurs in the shape of a fluctuating tumour, and is known as ranula. Dilatation of the ductuli and their terminations sometimes puts on the shape of serous cysts.

The contents of the salivary ducts, i. e. the saliva of the mouth and stomach, occasionally offer rather remarkable anomalies in reference to quantity, colour, consistency, and probably, as indicated by the taste, and especially by its acid or alkaline reaction, in reference to chemical constitution. Not unfrequently calculous concretions, the so-called salivary calculi, are generated in the saliva, and this is more especially the case in the ducts of the sublingual gland and the pancreas. They are white, friable, and either round, oblong, cylindrical, or obovoid; in size varying from that of a millet seed or a pea, to even that of a hazel nut; they are either solitary, or if small, frequently very numerous (twenty and more); and they are composed of phosphate and carbonate of lime, held together by animal matter. These calculi give rise to obturation of the ducts, and consequent accumulation of the secretion and dilatation.

At times, blood, pus, cancerous sanies, is found in the salivary ducts; bile is not unfrequently discovered in the pancreatic duct; in one case of migration of lumbrici into the biliary vessels, two were found to have crept into the latter.

PART II.

ABNORMITIES OF THE URINARY ORGANS.

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ABNORMITIES OF THE URINARY ORGANS.

Under this head we comprise the morbid anatomy of the kidneys and the efferent apparatus, viz. the calices, the bladder, and the urethra; the two are of course very intimately related to one another. The abnormities of the suprarenal capsules will be considered in an appendix.

SECTION I.—ABNORMITIES OF THE KIDNEYS.

§ 1. *Defect and Excess of Formation.*—The urinary apparatus is very rarely entirely deficient; it is generally found even in very imperfect monstrosities. One kidney is frequently absent, or individual portions of the system are, as we shall have occasion to see, more or less imperfectly developed.

When one kidney only is present, it is important to distinguish between the unsymmetrical and the solitary kidney. The former is represented by a right or left kidney, which is normal in regard to position and conformation, and occasionally rather enlarged, its fellow being deficient. The solitary kidney is the result of a fusion of the two organs, and therefore offers the characters peculiar to this arrangement in a greater or less degree. The lowest degree of fusion is seen in the horseshoe kidney (ren unguliformis); the two kidneys are united at their inferior portions by a flat, riband-like, or rounded bridge of tissue which crosses the vertebral column. In the higher degrees the two lateral portions approach one another more and more, until they reach the highest degree, in which a single disc-like kidney, lying in the median line and provided with a double or a single calyx, represents complete fusion. The more intimate this union is, the more the hilus of the kidneys is directed forwards, so that whereas, in the lowest degree, it is indicated by an evidently increased development of the posterior labium of the hilus, the hilus of the solitary kidney occupies the anterior surface. The more considerable the fusion is, the more the kidneys descend along the vertebral column, and the solitary kidney is commonly situated at the promontory, or even at the concavity of the sacrum. In exceptional cases only the solitary kidney is placed, like the unsymmetrical kidney, at the side of the vertebral column, on one side of the median line.

Excess of development occurs very rarely, except in the case of biventral monsters, in the shape of a third kidney, situated in the median line, and generally placed at the promontory; or in the shape of a single symmetrical kidney, which is composed of two kidneys united into one.

§ 2. *Deviations of Size.*—The kidneys are found enlarged or diminished in various degrees, and under various circumstances.

1. Enlargement is observed—

Firstly, Occasionally in one kidney, after its fellow has been deprived of its functions; this is a case of hypertrophy which may be considered as analogous to the increase of size in the unsymmetrical kidney;

Secondly, As congestive turgor;

Thirdly, As inflammatory swelling;

Fourthly, As a consequence of infiltration of the renal tissue induced by, or independent of inflammation; various forms of Bright's disease belong to this subdivision;

Fifthly, as arising from morbid growths, in which case the enlargement corresponds to their number and size;

Sixthly, As originating in dilatation of the pelvis and calices of the kidneys; the greater in this case the increase of size, the more will the renal substance become atrophied in consequence of pressure from within. Rayer states the left kidney to be normally of greater weight and larger dimensions than the one on the right side.

Abnormal smallness is either congenital, or the result of atrophy. Spontaneous and primary atrophy occurring independent of compression, contraction, or complete occlusion of the artery, is very unusual, and belongs almost exclusively to old age; secondary atrophy, resulting from and complicated with disease of the tissues, is much more frequent. In the case of extreme dilatation of the renal pelves and calices atrophy and enlargement appear combined.

2. Atrophy may affect the two substances of the kidney uniformly; or it may involve the cortical substance only; the latter is the more frequent case in secondary atrophy, on account of the greater proclivity to disease in the cortical substance. The tissue is rendered pale, or it may be distinguished by its darker colour, and the vessels are often found varicose. We very often find an unusual amount of fat accumulated round the atrophic kidney.

We shall have occasion to enter more fully into the subject of secondary atrophy, at a future period.

§ 3. *Deviations of Form.*—Besides the anomalous forms of the kidneys, resulting from fusion of the two organs, which we have already described, we may point to the lobulated kidney as an interesting conformation. It occurs as an arrest of development in the fœtal state, or if acquired, as atrophy of the cortical substance, accompanied by dilatation of the calices. There are other congenital malformations of the kidneys, which are of less importance, as for instance, the elongated kidney, which appertains to the fœtal state, the round, prismatic, triangular, cylindrical kidneys, the kidneys with a transverse furrow (separation into an upper and lower half); and also various acquired malformations, which are caused by external pressure, by partial loss of substance, and atrophy.

§ 4. *Deviations of Position.*—Here too we must first point to an anomaly resulting from the various degrees of fusion of the two organs, i. e. the descent of the kidneys to a lower part of the abdomen. This may, however, occur independently of the malformation alluded to, and we sometimes find one, sometimes both kidneys, as low down as the brim of the pelvis, or even as the hollow of the sacrum. The anomalies in the origin of the renal vessels which correspond to the original deviation of position deserve attention, as well as the increase in their number and the diminution of the ureter in proportion to the descent of the kidney.

The kidneys, and especially the right one, may be depressed by an enlarged liver, and the consequence is, that the hilus of the former is turned upwards, as the upper portion of the kidney is necessarily most depressed.

We have lastly to allude to the occasional moveability of the kidneys, which is owing to insufficient fixation by means of the adipose fascia, and apparently also to an elongation of the vessels; we sometimes find that the kidneys may be moved from one to two inches along the spinal column.

§ 5. *Deviations of Consistency.*—The kidneys sometimes offer a diminution of consistency, or relaxation, or an increase of resistency or toughness, without any apparent change of texture. The former occurs concurrently with a similar condition in other parenchymatous organs, and is the result of cachexia, anæmia, and marasmus, and of defibrination of the blood, from excessive exudations; the organs, in this case, are very pale and friable. Both an increase and a diminution of consistency are much more frequent as complications of textural alterations, and we shall examine them more in detail under this head. Genuine softening of the entire kidney, or of a portion of the organ, in the shape of spots of various sizes, of a dirty brown, chocolate-coloured, rusty pulp, is a very rare occurrence.

§ 6. *Solution of Continuity.*—This is produced not only by cutting instruments, but may occur in the shape of rupture, from concussion, or in consequence of falls or blows, received in the region of the kidneys. After a fall from a considerable height, rupture of the kidneys is very frequently complicated with laceration of other abdominal viscera. It gives rise to hemorrhage, inflammation, and suppuration; the latter terminates in the manner that we shall have occasion to delineate when speaking of renal abscess. Concurrent injury of the calices and of the pelvis of the kidney, causes extravasation of urine into and beyond the adipose covering of the kidneys: if the peritoneum has also suffered, a fatal termination ensues rapidly; if not, a permanent or temporary cure, with a residuary fistula, may follow.

§ 7. *Diseases of the Tissues.* 1. *Hyperæmia, apoplexy, anæmia.*—Hyperæmia of the kidneys not unfrequently occurs in the active form accompanying an exaltation of the renal functions; or as passive congestion in consequence of general marasmus, and especially in consequence of paralysis of the spinal and ganglionic nerves, such as we find in the torpid condition of the sympathetic in the insane, connected with abdominal plethora and congestion, and in paraplegic cases; it also occurs in the mechanical form as a consequence of impeded circulation in connexion with hyperæmia of other organs. The effects are, swelling of the organ (congestive turgor) and increase of size, greater depth of colour of the tissues, increased density and resistency, and loose attachment of the fascia propria. In children the tubular portion is frequently the chief seat of hyperæmia. When it has reached a high degree, it is apt to give rise to spontaneous hemorrhage (renal apoplexy), which, both in children and adults, has its main seat in the pyramids. We then find in the place of the pyramids, a spot of various dimensions, which has pushed aside a proportionate amount of parenchyma, and contains besides coagulated dark blood, the broken-up remains of the tubular substance. A cure undoubtedly ensues occasionally; the effusion gradually loses its colour, and assumes a rusty and a yellow tint; it is then absorbed, and the calyx becoming obliterated, a fibro-cellular cicatrix closes up the cavity. Minute hemorrhagic spots, in the shape of ecchymoses of the tissue resulting from an acute disorganization of the blood, as well as small extravasations under the tunica albuginea, are of much more frequent occurrence.

Hyperæmia accompanied by increase of size (hyertrophy), is, according to the few cases we have been able to examine, the only anomaly of the kidney, demonstrable in diabetes by the pathological anatomist.

Anæmia of the kidneys occurs not only in connexion with general impoverishment of the blood, but it is found as a more or less characteristic symptom, in all those cases in which the renal parenchyma has become impermeable from being infiltrated with coagulable matter, either owing to inflammation or deficient nutrition; this is particularly the case in that disease which is commonly cited as the type of the class, Bright's disease of the kidney.

2. *Inflammation.*—Inflammation of the kidneys is either primary, secondary, or metastatic; in the first case it results from injury, concussion of the intestines, cold, or specific irritation (turpentine, cantharides, &c.); in the second it follows acute or chronic diseases, and it then presents a more or less

remarkable type, corresponding to the general dyscrasia; in the third instance it arises chiefly from inflammations of the pelvis and calices, or from inflammations of the fascia adiposa and adjoining organs. The inflammation runs an acute or a chronic course; the idiopathic variety being particularly liable to the former.

The cortical substance is the chief seat of the first two varietes, as of textural alterations generally; when the inflammation commences at the pelves of the kidneys, the tubular substance is naturally implicated also. In the former case we often find one or both kidneys, either simultaneously or in rapid succession attacked throughout their substance; whereas the latter commences in spots from which it extends through the renal tissue.

The following are the anatomical characters of acute inflammation of the kidneys, modified of course by the degree and the acuteness of the affection.

Hyperæmic tumefaction and redness of the organ are followed by a uniform discoloration of the parenchyma which appears of a dirty brown or purple colour, and filled with a dark sanguinolent fluid; it is either turgid and resistent, or collapsed, flabby, and very friable; or it may be turgid and friable, and the discoloration less uniformly grayish-red, or dirty white, accompanied by infiltration of a denser, coagulable, fibrinous substance, the texture is granular, the surface scattered over with an injected, asteroid, and polyhedral vascular network, and the fractured surfaces or sections made in the direction of the hilus, are streaked with striated vessels.

The general result of the infiltration is, that the organ is more or less swollen and discoloured, and that its consistency is variously diminished. In accordance with what has been above remarked, we find the cortical substance chiefly affected; the affection is general or partial, and in the latter case it occupies particularly the superficial layer; in the first instance the swollen cortical substance is found to have forced its way into the basis of the pyramids, between the fasces of the tubuli, and they consequently appear unravelled and fimbriated.

The process not unfrequently extends to the tubular portion itself, or the latter is involved in the inflammation propagated from the pelvis. The pyramids then appear enlarged, swollen, pale; their colour changed to a dirty brown, or grayish-red, and softened or indurated according to the nature of the inflammatory product; the inner membrane of the calices and pelvis is in both cases injected as in catarrhal inflammations, reddened and relaxed, and filled with an opaque, flaky, grayish or yellowish-brown fluid.

Externally we find the fascia propria, and even the adipose covering of the kidneys involved in the inflammatory process: the former is easily detached from those portions of the surface which present the vascular injections above spoken of, its tissue is more or less injected and tumefied; the latter is infiltrated with serum, and softened.

This inflammation occasionally affects one kidney only, but very often both are simultaneously attacked: in the latter case, especially, it is liable to terminate fatally, in consequence of paralysis of the renal function with typhoid symptoms, resulting from retention of the urea in the blood; this is frequently complicated with serous effusion into the ventricles of the brain, or into the pulmonary tissue, followed by putrescence; or if the inflammation reaches a certain degree of intensity, suppuration, or an excessive retrograde process, or atrophy may result; or, lastly, the affection may become chronic.

Suppuration is not a frequent consequence. The inflammatory product which has been infiltrated in detached sections, or uniformly throughout the organ, is converted at first into small punctiform or millet-sized spots of white, creamy, or yellow pus, which subsequently coalesce into a small abscess. In its vicinity a renewed reactive process is set up, and we find a red injected halo, varying in size, which gives rise to a similar fusible product leading to an extension of the abscess. The original small abscesses are sometimes found scantily dispersed through the kidney, at others they are grouped together, at others, again, they are thickly sown through the entire kidney; they are then characterised by the surrounding inflammatory halo, and this renders them conspicuous though individually almost imperceptible. They are always incomparably more numerous in the cortical substance; they here generally retain their rounded shape, even whilst enlarging, whereas in the tubular substance they are converted into elongated striated abscesses.

In the manner just described, as well as by the coalition of several abscesses, we see an extensive purulent accumulation brought about, which may increase so as to occupy one half or two thirds, or more, of the kidney. Moreover, there may be one or more of these accumulations, and their existence establishes phthisis renalis.

Renal abscess extends in the most various directions from the inflammation and suppurative fusion spreading through the kidney, and even beyond its sheath; we most frequently find it presenting excavations or sinuses, backwards and downwards; it causes death by exhaustion, or if the progress of the fusion is stopped, the surrounding parenchyma may become obliterated, or in the case when suppuration has extended beyond the latter, the fasciæ of the kidney may become converted into cartilaginous tissue, and the abscess thus be inclosed and be borne for a long period; it may be reduced in size, and may even heal up, leaving a cicatrix; this is particularly liable to result after an opening and a discharge have been effected in a favorable direction.

This discharge may take place:

Firstly, into the cavity of the renal pelvis; the pus is then discharged by the urinary passages;

Secondly, into the peritoneal cavity;

Thirdly, externally in the lumbar region, by means of sinuses of various dimensions;

Fourthly, After previous agglutination of the intestine to the walls of the abscess and perforation, into the cavity of the former; it is evident that the ascending and descending colon, and the sigmoid flexure, are particularly liable to be thus involved, and in second order the duodenum.

Fifthly, Renal abscess has also been seen to communicate with the lungs after perforation of the diaphragm; its contents are then expectorated in the shape of urinous-purulent sputa.

These discharges may sometimes take place in various directions at once; a combination of the discharge into the urinary passages with elimination of urine by a false passage —renal fistula, is of especial interest.

Termination in gangrene or gangrenous suppuration is extremely rare; it is more usual to find acute inflammation passing into the chronic form.

Chronic inflammation of the kidney either commences in that form, or is the result of acute inflammation, or, as is most frequently the case, it is the consequence of inflammation of the urinary passages, and especially of the calculous variety. It is distinguished from acute inflammation by a lower intensity of the symptoms, by its smaller extent, and by the variety of stages presented by the coexisting and consecutive inflammatory spots. Chronic inflammation also not unfrequently terminates in suppuration, which is particularly the case with the variety originating in calculous irritation of the renal pelvis; it also frequently terminates in induration and obliteration of the parenchyma, or induces atrophy of the kidney.

In the former case the coagulable portion of the infiltrated and accumulated product of inflammation is converted into a whitish, fibro-lardaceous, cartilaginous callus, in which the renal parenchyma has entirely disappeared. The kidney is often found increased in bulk, and appears altered in shape, from the irregular accumulation of the product, giving rise to various tuberculated projections. This tissue may here, as elsewhere, subsequently become shrivelled and condensed, and is also, in a few cases, the seat of bone-earth deposit, osseous transformation, ossification.

Chronic inflammation is, like the acute form, frequently followed by atrophy of the kidney; inasmuch as not only its product but the original tissues themselves become absorbed. This secondary atrophy attacks either the entire kidney or sections of the organ, and the consequence is, accordingly, a uniform reduction of its size, or a partial contraction, which gives the kidney a shrivelled and uneven, lobulated surface. The contraction sometimes advances to such a degree, that the kidney appears reduced to the size of a hen's or even a pigeon's egg, it is surrounded by the tunica albuginea, that has become thickened by the inflammatory deposit, and by contraction, and forms a callous sheath of several lines in thickness; on closer examination we find the cortical substance reduced to a mere vestige; the pyramids are diminished to a size corresponding to the dimensions of the organ; the tissue generally is of a pale red, or here and there of a slate-gray colour, denser, tough, and fibro-cellular; occasionally, however, it is unusually dark red, vascular, and congested, and all the vessels dilated. The calices and pelves are uniformly enlarged, the ureters contracted, their parietes shrivelled and thickened, and here and there approaching to obliteration, or actually obliterated.

Inflammation of the kidneys, with its consequences, has occasionally been discovered in new-born infants; but its frequency and importance are much more considerable at maturity and at the advanced periods of life.

3. *Bright's disease of the kidney.*—This affection of the kidneys, which has been named after its discoverer, Bright, and has of late been extensively investigated, is of extreme importance. It has been termed granular degeneration by Christison, and néphrite albumineuse by Rayer. We treat of it in connexion with inflammatory affections of the organ, for reasons which will appear in the sequel.

It is generally a chronic disease; however there are numerous cases that incline to an acute course, and some equal, or even exceed, acute inflammation in rapidity.

It assumes very different forms, which have reference either to the degree and rapidity of the disease, or to its stage of development; the former bear a close relation, first, to the amount of local reaction in the renal tissue, and, secondly, to the dyscrasic state of the blood. We shall commence by describing the various phases which the disease presents as distinct forms; we shall then examine its complications, their course, stages, degrees, and transitions, and lastly, arrive at a general analysis of the disease.

The cortical substance is that which is primarily and chiefly affected; in the course of the disease, however, the tubular substance also becomes involved in the manner which will be immediately delineated.

First form.—The kidney appears enlarged, swollen, heavier; the cortical tissue is almost uniformly infiltrated with a dirty brownish-red, turbid fluid, and the blood-vessels, with the tissue immediately surrounding them, are delineated on this background in the shape of spots, or streaks of a darker red. Other red spots may be visible, which are owing to extravasations of blood into the tissue,—ecchymoses. The pyramids, however, present a similar though darker discoloration, with dull red striæ. The entire parenchyma, but more especially the cortical substance is peculiarly pulpy and friable, and the surface, presented by section or fracture, yields a reddish-brown, limpid, delicately flocculent and opaque, sanguinolent and slightly viscid fluid. The organ generally is characterised by a turgid though flabby state. The fascia propria, from the injected state of its vessels, but more from the exudation of blood into its tissue, is of a dirty red colour, and is easily detached; the mucous membrane of the calices and pelvis is similarly reddened and tumefied; and their cavity contains a thin, muco-sanguinolent, turbid, urinous fluid.

Second form.—Besides the increase in size and weight found in the first variety, the cortical substance presents an infiltration of a grayish or grayish-red, or yellow, viscid, and turbid fluid, which pervades it uniformly or in diffused spots; the colour of the tissue corresponds, and if more carefully examined, an indistinct, dotted, or linear arrangement is perceived. At the same time, small punctiform or striated ecchymoses are found, which are the more conspicuous the paler the colour of the infiltrated tissue. The tissue frequently presents the infiltrated and pallid appearance in some parts, whilst the hyperæmia and ecchymoses predominate in others; this constitutes the combination of partial anæmia and hyperæmia, alluded to by authors as a special variety. The organ appears of diminished firmness, but this character is less marked here than in the first form. The renal fascia observes the same bearing, the mucous membrane of the pelvis and calices of the kidney is of a roseate hue, and tumefied; and the latter contain a flocculent, turbid, yellowish or reddish-white fluid.

Third form.—There is considerable enlargement and increase in weight; the cortical substance is completely anæmic; and only a few solitary dilated vessels, bearing an asteroid, convoluted, or striated appearance, are seen in it. The cortical portion presents an increase in diameter of from five to nine lines; its surface is smooth and slightly glossy; it is tense, friable, and infiltrated with a large quantity of opaque, milky-white, or yellowish fluid. The superficial layer more particularly, but also the deeper-seated parts, are found to be made up of white or yellowish-white, loose, tense granules (Bright's granulations), of the size of a poppy seed, or a pin's head; in the neighbourhood of the pyramids these granulations assume a linear appearance.

The increase of the cortical substance either extends to the base of the pyramids only, or affects those portions also that dip down between the latter; by this means the pyramids, and more particularly their apices, become compressed. The pyramids are of a pale red colour, and from the granular cortical substance forcing its way between the tubuli and separating them, the basis of the pyramids presents a frayed or unravelled appearance, resembling a plume with dependent feathers, or a sheaf of corn.

The renal facia is easily detached; its tissue is swollen and opaque, the mucous membrane of the calices and pelvis of the kidney is reddened, and there is a milky, turbid, viscid fluid in their cavities.

Fourth form.—The increase in size and weight is very considerable, and the consistency of the tissues is much diminished; the cortical substance is very tense, and here and there appears almost fluctuating; its tissue is completely anæmic and very friable, and gorged with a large quantity of milky-white or yellowish juice. The granulations exceed the size of millet seeds, and equal that of hemp seeds; and as this enlargement is chiefly effected in the peripheral layer, they project from the surface of the organ, and give it a racemose appearance. Occasionally, we find this increase of size occurring with great rapidity in sections, and we then have an accumulation of granulations shooting like a cauliflower from the surface, and producing irregularities and nodulated protuberances upon the kidney. The granulations are very soft, tear, and dissolve upon the slightest touch; the renal sheath is almost unattached, the pyramids are of a pale red colour and undefined, and the reddened calices and pelves contain a viscid creamy fluid.

Fifth form.—The kidneys are enlarged or of the normal size, or they may be reduced in size; their surface is granular and racemose, or whilst certain portions present the nodulated and prominent appearance, others are irregularly furrowed, indented, and cicatriform. The cortical tissue is coarsely granulated, looser in texture, very vascular and congested, and the vessels are varicose; or else we find it, as in the case of a diminution of the organ, of a pale yellow or ashy hue, exsanguineous, of coriaceous density, and mainly of a fibro-cellular texture; the indentations at the surface here and there present a similar tissue, of a whitish or slaty colour. We also not unfrequently see cysts, containing the most various substances, and varying in size from that of a poppy seed to that of a pea or a nut and more, scattered through the cortical structure.

In the former case the attachment of the fascia propria is slight, in the second it is more intimate; the fascia is thickened, and the adipose layer indurated. The pyramids are small and atrophied, of increased density, and generally of a dirty brown colour; the calices and pelvis are slightly contracted.

Sixth form.—The organ is but little increased in size and weight, the cortical substance only presents a few undefined patches of a paler colour, and the prevailing hue is either pale red, or it is found on closer examination to offer transitions of a pale red, a white, yellow, or ashy colour. It is infiltrated with inspissated matter, resembling thick cream or coagulated albumen; and not only does not present greater laxity of texture, but is of the normal or even of increased consistency.

The fascia propria is but slightly less adherent at these points than in the healthy condition, and the pyramids, as well as the calices and pelvis, are normal.

Seventh form.—The increase of size is commonly trifling; occasionally there is partial atrophy and diminution. There is increase of density and consistency. As in the last variety, the cortical substance only presents patches of a dull white colour, which have no defined borders, and are often very extensive; it arises from a coagulated, albuminous, lardaceous-looking substance, in which no trace of the renal tissue remains. We here find considerable swelling of the kidney, owing to the copious deposition of the morbid growth; or the organ otherwise seems shrunk, and presents the appearance and consistency of fatty cartilaginous tissue. One or more of the pyramids occasionally undergo a similar metamorphosis. The fascia propria is agglutinated to the diseased portions of the kidney, and thickened; the lining membrane of the calices and pelvis is tumefied.

Eighth form.—The kidney presents but a slight increase of size, or is of normal dimensions, but always considerably indurated. The general hue is a dirty red or brownish-yellow, and the cortical substance presents a fatty waxy gloss, is unusually hard and brittle, and infiltrated with an albuminous, lardaceous, and transparent substance. Occasionally a whitish flocculent deposit is seen in the tissue, of the shape of fine granular dots and lines, giving to the surface and to sections a marbled appearance.

We have thus enumerated the forms which, in a general point of view, we think it proper to class under Bright's disease. The first seven forms undoubtedly belong to the latter, if the totality of the symptoms, as they appear in the living subject, be considered: they also occur complicated with one another, and the second, third, fourth, and fifth forms more particularly represent Bright's disease and Christison's granular degeneration of the kidney. In the latter form the disease is generally chronic, though with an acute tendency and occasional exacerbations; the second, third, and fourth forms represent progressive stages or degrees of the metamorphosis occurring in Bright's disease: they vary in duration, and pass from one to the other either gradually or, as is frequently the case, with very tumultuous symptoms. Each of these stages may prove fatal. The fifth form is the last link of the metamorphosis; with it the process becomes retrograde, and the disorganized tissue of the viscus presents the condition of secondary atrophy. The different varieties are not unfrequently complicated with one another; and we thus find the first degree (second form) attacking one kidney, or a section of one kidney, whilst the other kidney, or the other sections, present the metamorphosis of the third or fourth degree (third and fourth form). The peripheral layer of the cortical substance is generally in a more advanced stage than the deeper-seated layers.

The sixth and seventh forms represent the less frequent or chronic varieties of the disease; the latter (the seventh) must be looked upon as the terminal point of the metamorphosis, as the product of the disease is retained in a state of condensation and organization, and subsequently shrivels up. It is sometimes complicated with the varieties previously spoken of.

The first form is extremely rare, and runs an acute course; on the occurrence of powerful exciting causes, very tumultuous symptoms are sometimes induced, which speedily reach their climax, and may terminate fatally on the fourteenth day.

The eighth form is invariably chronic; we shall for the present exclude its consideration from the following remarks, and advert to it subsequently, for reasons that will then be apparent.

The nature of the disease, and the scientific exposition of its characteristic symptoms, have been the subject of numerous discussions, and we neither venture to assume that our remarks will add great weight to the arguments of those who consider it inflammatory, nor do we wish to anticipate further investigations and statements of depth and originality.

We consider the nature of Bright's disease to consist in an inflammatory process, which proceeds from a stage of hyperæmia to one of stasis, and then gives rise to a product, which is not only remarkable by its peculiar character, but which, in well-marked cases, by its excessive accumulation, causes a singular alteration in the appearance and structure of the kidney. It commonly runs, as we have already stated, a chronic course, with occasional exacerbations, but it is sometimes acute. In the latter very important cases, in which, from the tumultuous violence of the exudation, the product is mixed with a large amount of serum, and is generally reddened by the colouring matter of the blood, and in which, the characteristic milky or creamy coagulated substance of well-marked Bright's disease is not formed, we should be obliged to consider the condition as one of very acute simple inflammation of the kidneys, were it not that the characteristic general symptoms and the constitution of the urine established it as a case of Bright's disease.

The whitish or ashy, milky or creamy product, which may resemble albumen in its various degrees of coagulation, and consists of solitary and accumulated molecules, or of more or less globular fibrinous coagula, and pus-corpuscles (Gluge), is an albumino-fibrinous substance, with a predominance of albumen; the amount in which it occurs is proportioned to the amount of granular degeneration.

The product may, as in simple inflammation, be deposited at every point of the renal parenchyma external to the vessels, but we find it more particularly in the Malphighian bodies (glands), and subsequently in the urinary tubuli; the granulations of Bright's disease are therefore in reality the Malphighian corpuscles charged with the above-named substance. The more the latter accumulates, the more it interferes with the circulation, hence the peculiar pallor or anæmic condition of the organ.

The cause of the peculiar character of the product is the more obscure, since the question is generally evaded. As the amount of reaction that takes place in the renal tissue does not suffice to explain it, we are led to seek the cause in an anomalous constitution of the blood, consisting in an excess of albumen, which may originate in a decomposition of the fibrine. This becomes the more probable, when we consider that the most frequent exciting cause (cold) appears peculiarly adapted to give rise rather to a change in the blood, than to a disease of the kidneys, and that the infiltration of the kidney, which we have examined as the eighth form, is evidently developed as a sequel of the cachexiæ which we shall shortly investigate, and in complication with similar affections of other organs (liver, spleen). Although we might offer numerous observations on this connexion, the real cause of the development of the renal disease from the crasis of the blood, which often takes place with such extreme rapidity, is to us an enigma. We look upon the anomalous condition of the blood in Bright's disease as the primary affection, which, from a peculiar relation to the kidneys, is followed by the secondary and visible disorganization of the renal tissue; this need not however always ensue, at all events it does not follow as rapidly as the structural disease of the kidney, consequent upon the vegetative disturbance that causes diabetes mellitus. By this means we explain how it happens that the two kidneys are generally attacked at the same time or at brief intervals. Graves is of opinion that the change of texture is induced by the free acids of the urine (phosphoric and nitric acids) coagulating the albumen as it passes into the urinary tubuli.

Bright's disease is distinguished in the dead and the living subject by the following symptoms:

a. We may briefly enumerate the following as occurring in well-marked cases in the kidneys themselves,—increase in the size and weight of the organ, and especially of the cortical substance; (the hypertrophy of French authors, a term which may easily give rise to a misapprehension;) anæmia, pallor, laxness of the tissue, development of peculiar granulations, inflammatory sympathy of the renal fascia, on the one hand, and of the mucous membrane of the pelves and calices, on the other.

β. The so-called consecutive symptoms: a constant and considerable amount of albumen in the urine, accompanied by a diminution of its specific gravity (Gregory), a symptom considered by Rayer as belonging to the chronic form only; a reduction of the solid constituents, viz. the salts and urea, a milky turbid appearance, or if tinged with blood and blood-corpuscles, dark discoloration, eminent serosity of the blood arising from the removal of the albumen, and accompanied by a diminished specific gravity of the serum; dropsy, which is chiefly manifested as anasarca, with marked pallor of the surface, and secondarily as serous effusion into the serous cavities, and especially of the pleura and the peritoneum. Of the latter symptoms the albuminuria and the dropsy have long since been the special objects of explanatory attempts.

Albuminuria is considered by Gregory as pathognomonic only when the specific gravity is simultaneously diminished; it seems to ourselves to consist in a disturbance of the catalytic function of the kidney, arising from the homologous infiltration of the renal tissue; albumen is in part deposited in the channels of the urinary tubuli themselves, as a product of the reaction. There is not, however, a proportionate relation between the degree of the albuminuria and the amount of renal disease, as we may even find the former existing without the latter.

Sabatier, whose views are not materially controverted by Rayer's objections, attributes the dropsical affections to an attenuation of the blood, produced by the removal of the albumen. This crasis of the blood must, therefore, be viewed as secondary.

The lower degrees of Bright's disease are curable by resolution, without leaving any traces, like other moderate inflammatory processes. In the advanced stages a cure may be effected, but only with considerable alterations of texture, as manifested in atrophy of the kidney with a racemose surface, varicosity of the vessels, cellulo-fibrous condensation of the tissue, fibro-lardaceous thickening of the renal fascia, and contraction of the pelvis and calices, in induration of the product, and its conversion into a contractile callus. A fatal termination is induced, with greater or less rapidity, by dropsy, and especially by serous accumulations in the large cavities of the body, by the slow or sudden supervention of serous effusion into the ventricles of the brain, into the cerebral substance, and into the pulmonary parenchyma, by anæmia, by the retention of urea in the blood, or by morbid conditions of other tissues and organs, which present accidental or essential complications with the renal disease and its predisposing cause.

In the case of retention of urea in the blood, the resulting symptoms are owing to the antagonism between the urea and the nervous matter; they consist in coma, delirium, convulsions, and tetanus, and are not unfrequently caused by urinous effusions within the cavity of the cranium.

The complications are chiefly dependent upon causes that operate suddenly or repeatedly, and for a considerable period, such as catarrhs, and particularly bronchial catarrh, rheumatism, with or without endocarditis, and their sequels; the complications may also originate in the secondary disorganization of the blood, and here again we meet with catarrhs, and also with extensive exudative processes, both on the mucous membranes (serous diarrhœa, pneumonia[1]), and, more especially, on the serous membranes, the arachnoid, pleura, peritoneum, and internal coat of the blood-vessels (phlebitis). Hemorrhage and apoplexy are of rarer occurrence. There is great difficulty in accounting for the complication with granular liver, and with the ascites resulting from the latter affection. The supervention of Bright's disease as a new complication may probably be accounted for by the greater liability of a previously diseased subject to the reception of noxious influences, whether operating continuously or temporarily; we allude more particularly to the abuse of spirituous liquors, and to cold.

The commonest and most evident cause of Bright's disease is cold, the sudden or constant influence of cold damp air, more especially; at all events, the occurrence of Bright's disease after scarlatina in children and adults, is most frequently due to this cause; the abuse of spirituous liquors is also considered as a cause, though chiefly in connexion with the previously mentioned influences; diuretics, though they do not originate, undoubtedly promote the disease.

Numerous dyscrasic momenta are of considerable importance.

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[1] [Qy. Bronchitis ?—Ed.]

We advert to the development of Bright's disease, subsequent to exanthematic fevers, particularly scarlatina, to typhus, to tubercular disease and tubercular suppuration, e. g. pulmonary phthisis, to cancerous diathesis, and to the affections which we are about to consider in connexion with the eighth form.

The eighth form invariably sets in without reaction, and springs from inveterate scrofulous or rickety disease, but especially from syphilitic and mercurial taint. It presents itself as a constitutional infiltration of the kidney, and is associated with analogous affections of the spleen and liver, in the shape of lardaceo-albuminous infiltration; both the nature of this product and the anomalies of the blood and the urine as yet remain a perfect enigma. We have once noticed the complaint as a sequel of intermittent fever combined with a similar condition of the spleen.

4. *Deposits in the kidneys.*—The same circumstances that give rise to deposits or metastases in the lungs, the liver, and the spleen, may induce them in the kidneys. They follow inflammations of the endocardium, and of the lining membrane of the vessels brought on by infection of the blood, arising from absorption of the inflammatory product, or they result from suppuration and gangrene of membranous and parenchymatous tissues produced in a similar manner, or lastly, they originate in spontaneous pyæmia. We would again direct especial attention to the deposits arising from endocarditis, as they have not only been overlooked, in the same way as those occurring in the spleen have been, by the most distinguished inquirers, but as of late Rayer has interpreted them falsely, and has viewed them as symptoms of rheumatic nephritis.

They are found in endocarditis, generally coexistent with similar deposits in the spleen, consequent upon primary phlebitis with a purulent exudation, or upon the absorption of pus or sanious matter from ulcerating surfaces or abscesses; they coexist with deposits in the lungs, the liver, the brain, the subcutaneous, and intermuscular cellular tissue, the interstitial cellular layers of the intestines, and with secondary phlebitis, in the most different portions of the venous system.

There may be only a few, and in endocarditis we generally find one only, or they are as under the last-named conditions, very numerous; in rare cases the kidney is entirely gorged with them.

They occur chiefly in the cortical substance, and here again mainly in its peripheral strata; so that they are at once apparent on the removal of the fascia albuginea; it is only in exceptional cases, and when they are very numerous, that they occur in the pyramids. They vary much in size, from that of an almost imperceptible poppy seed, to that of a millet or hemp seed, of a pea, a bean, or of a walnut; the larger ones present the peculiar form described in the section on the spleen, as exhibiting a pyramidal shape, the base of which is directed towards the surface, the apex towards the interior of the organ; the smaller ones appear as rounded nodules. The intermediate sizes are the most frequent, but when very numerous, they generally remain so small as scarcely to exceed the size of millet seeds.

They commence in the renal parenchyma as dark red indurated spots, which correspond in extent to the above-mentioned sizes; they gradually assume a dirty brown, yellow, or yellowish-white colour, and are surrounded by a light red inflammatory halo, which indicates the reaction set up in the adjoining tissue, or if the disorganization advances to a high degree, by a dark red, discoloured ecchymosis. The latter appearance is coincident with a very large number of the deposits, and as we have seen that these must then be very small, we find the renal tissue presenting in the advanced stage of the disease very numerous small red spots, in the centre of which an almost imperceptible yellowish-white spot is discovered.

The further progress of the disease consists in a conversion of the deposit into a purulent or sanious fluid, and the abscess may be enlarged by an analogous transformation of the inflammatory halo; the metamorphosis may, however, be benignant, and the deposit become pale, and shrivel up; it may then, together with the involved tissues, be absorbed, or partially retained as a pulpy or cretaceous mass, having a cicatriform cavity with a fibro-cellular investment, or a fibro-cellular callus, which corrugates and draws down the surrounding parts; a greasy yellow substance or chalky concretion is found buried in the callus, and like the investment of the first-mentioned cavity, this is agglutinated to the tunica albuginea.

The deposit is essentially an exudative process, the product of which undergoes the described metamorphoses; or it depends upon stasis and coagulation of the blood in the capillary vessels, and a conversion of the fibrine in the manner above described,—a secondary angioitis (phlebitis) capillaris. Both metamorphoses are known to be induced by something that is taken up by the blood; and we thus generally see deposits in the kidneys resulting from endocarditis, which go through the second metamorphosis, and heal with loss of substance of a small section of the cortical tissue.

In the case of solitary deposits, the parenchyma, with the exception of that adjoining the morbid product, does not participate in the local process; when they are very extensive, reaction takes place throughout the organ, and is evidenced by tumefaction, enlargement, softening, and infiltration of the parenchyma; even the mucous membrane of the urinary passages appears congested, reddened, and softened.

5. *Morbid growths. a. Fatty deposit in the kidneys.*—We shall examine this subject under the head of hypertrophy of the fascia adiposa.

b. Formation of cysts.—Although we explicitly exclude the consideration of all encysted tumours which have their origin in a dilatation of the urinary passages, and especially of the calices, we think it necessary at this place to discuss—

a. Cysts, that occur frequently in the renal parenchyma, and which we cannot positively state to be new formations. We allude to cysts which vary in size from that of a millet seed, pea, or bean, to that of a walnut or even a goose's egg, and which contain a clear, colourless, or yellowish, serous, alkalescent matter, or a substance of a yellowish or brownish colour, and of a melicerous or mucilaginous consistency, or again, of a lateritious, chocolate-coloured or inky (melanotic) tint. They are formed by a serous membrane, in which a branched vascular network may be traced. They vary in number; sometimes there is a solitary cyst of one of the above-named sizes; generally there are several of different sizes, and in rare cases, they are so numerous, that the kidney, being proportionately enlarged, appears converted into a collection of cysts varying both as to size and to contents, the renal tissues having given way to them. In very well-marked cases a diminution of the urinary secretion, and its consequences, have been observed. These cysts are chiefly developed in the peripheral layer of the cortical substance, and project above the surface of the kidney, so as to be at once perceptible on the removal of the tunica albuginea.

They occur at every period of life, and are sometimes even congenital. They acquire additional importance if developed in consequence of renal inflammation, especially when this arises from lithiasis, and more particularly in consequence of Bright's disease.

Our own view, and that of German authors generally, is that they are not the dilated terminations of the Malpighian capillary tubes, but that they consist in a conversion of the cellular layer in the Malpighian corpuscles into serous cysts, resulting from the pressure exerted by the Malpighian corpuscles when tumefied and gorged with the inflammatory product of these diseases upon the surrounding strata. The latter during their metamorphosis take up the vessels of the renal coil (Nierenknäuel) for the purpose of the new secretions. It would not be surprising if their contents were occasionally urinous, but we have never been able to discover a trace of urinous precipitates or concretions in them. We have once found a cyst that was seated at the circumference, and was of considerable size, inflamed and ruptured, and its contents effused into the adipose layer.

β. The acephalocyst is a morbid product that occurs in the kidney; less frequently certainly than in the liver, but more frequently than in any other organ. We have no particular remarks to offer in reference to the relations of this variety of encysted tumour, to its contents, or to the surrounding tissues, except that it occasionally reaches the extraordinary size of a fist or child's head, and that it may discharge its contents in various directions. The following modes of discharge are important:

aa, Communication of the cyst with, and its discharge into the colon (the ascending or descending colon), and consequent evacuation per anum, and

ββ, The communication of the cyst with, and its discharge into the cavity of the renal pelves and calices. Small acephalocysts, or ruptured larger ones, may thus be conveyed by the ureters to the bladder, and be evacuated, as is particularly the case with females, by the urethra (mictus acephalocysticus), or they induce obstruction and dilatation of the urinary passages by their size.

γ. The composite cystoidea rarely occur in the kidneys; though when they are formed, they attain a considerable size. We have in our museum an illustrative specimen, in the left kidney of a boy of five years of age.

c. *Anomalous, fibrous, and osseous tissue.*—We find fibroid masses of various extent and shape developed in the products left by inflammation and Bright's disease; and in rare cases a deposition of osseous substance is effected within them, in the same manner as we find occurring in the fibrous exudations of serous membranes. The calcareous concretions are not however in this case laminæ, but irregular tuberculated masses. We also find that a fibrous tissue of recent formation constitutes the external layer of the acephalocysts and composite cystoidea, as well as the base and fundamental structure of cancerous growths in the kidneys.

d. *Tubercle.*—Tubercle exists in the kidneys under two distinct conditions; in both, however, the cortical substance is the chief seat of the deposit.

a. In one case, it is the result of a very high degree of tubercular dyscrasia; a partial symptom of the development of tubercular disease in many or the majority of organs, and, in that case, frequently the product of a very tumultuous process of deposition. The tubercles are found to exist in great numbers, and occur in the shape of grayish-white, delicate vesicular, or larger, i. e. miliary granulations, surrounded by congested and ecchymosed parenchyma. The entire viscus is swollen, gorged, and softened; it is hyperæmic, and either darker than ordinary, or paler and infiltrated, and the mucous membrane of the urinary passages is reddened and injected. If the morbid process takes place with less intensity and has a more chronic duration, the tubercular matter is found in less quantity, of the size of millet or hemp seeds, and surrounded by pale tissue, which presents no trace of reaction either in the vicinity of or at a distance from the tubercular deposit.

This form of renal tubercle occurs as a complication of tubercular deposit in most parenchymatous organs and membranous expansions; and especially in conjunction with tuberculosis of the abdominal viscera, and more particularly of the spleen, the liver, and the peritoneum. Even when occurring under violent symptoms, it is rarely fatal by itself by paralysis of the renal functions, but it becomes so by the universal affection and by the coexistent disease of other organs. This variety of renal tubercle, even when its progress is less rapid, rarely proceeds further than to a yellow discoloration, and never advances to actual fusion. Both kidneys are commonly attacked uniformly.

β. In the other case, renal tubercle is a partial appearance of tubercular disease that is limited to the male urinary and sexual organs. It then generally attacks the testes and the allied lymphatic and prostate glands primarily, and extends from these to the urinary apparatus, i. e. the mucous membrane of the entire tract, to the kidneys, and, lastly, to the supra-renal capsules. It is commonly viewed as possessing a blennorrhoic character or as gonorrhœal tubercle; but post-mortem examinations have not established the fact by demonstrating any peculiarity in the tubercular deposit. It very often supervenes upon a previous tubercular condition of the lungs, or the latter, as well as tubercle in other organs, allies itself to the advanced stage of renal tubercle. This variety of renal tubercle frequently reaches a high degree as regards the number of the tubercles, and their gradual accumulation into extensive groups and coalition into large masses. The viscus is found to have increased in size and is nodulated, and the tissues in the vicinity of the tubercle, or throughout the organ, are in a state of chronic reaction, and appear pale and dense, and infiltrated with lardaceous matter, and the tunica albuginea is thickened. This form of renal tubercle frequently passes more or less rapidly into the stage of softening, giving rise to tubercular ulceration (vomica renis tuberculosa), tubercular suppuration, and tubercular phthisis of the kidneys.

The disease generally attacks one kidney only in a very extensive degree.

e. Carcinoma.—Carcinomatous growths occur frequently in the kidneys, and in the primary form. This is particularly the case with medullary cancer, which we find attaining a very large size, whereas areolar and hyaline cancer are extremely rare. Of these, we have observed the former only twice, in combination with medullary cancer, and the latter only as a secondary affection accompanying universal cancerous deposit.

Medullary cancer appears either in the shape of more or less numerous distinct, rounded, circumscribed masses, varying in size from that of a pea to that of a walnut and a hen's egg, of dense or soft texture (encephaloid), white or variously coloured (melanotic); these circumstances generally attend the rapid development of universal carcinomatous deposition, and therefore indicate *secondary* cancer of the kidney; as a *primary* affection, it appears in the shape of a carcinomatous tumour, accompanied by partial infiltration and degeneration of the adjoining tissues; this tumour rapidly increases to the size of a child's or adult's head, forming rounded nodulated masses, which perforate the fibrous sheath, extend to the peritoneum, the lymphatic glands of the lumbar plexus, and involve the periosteum and ligaments of the abdominal vertebræ; the diseased tissue thus becomes fixed, after which occurrence it grows into the cavity of the renal pelves and calices, the renal veins and the vena cava, and causes their obturation.

The latter variety generally remains the focus of the carcinomatous cachexia and the sole cancer occurring in the body, on account of its extreme vegetative power; still we not unfrequently discover in its vicinity, and especially on the peritoneum, the diaphragmatic pleura of the diseased side, and in the liver, isolated cancerous deposits.

An important complication, and one that points to an analogy with tubercular disease, is that with medullary cancer in the testicle of the same side. The two commonly coexist, or the renal cancer is developed shortly after that of the testis.

We have noticed the disease not only in the middle period of life, but both in advanced age and in early youth (as early as in the fifth year). Both kidneys appear equally liable to the affection.

When the growth is effected with great violence, hyperæmia and hemorrhage not unfrequently occur in medullary carcinoma of the kidney, and when it extends into the urinary passages, we find that blood is effused into them also.

6. *Anomalous contents.*—Besides the anomalies already alluded to, we have to advert to the following morbid contents of the urinary canaliculi.

a. The formation of calculous urinary concretions, which appear in the shape of delicate granular crystals, dispersed through the substance of the kidney, and which consist of lithic acid.

b. Entozoa; these are, besides the animalcules inhabiting the acephalocyst, the cysticercus and the very rare strongylus gigas.

§ 8. *Special Diseases of the Investments of the Kidneys.*

1. *Hypertrophy of the adipose layer.*—The adipose tissue which surrounds the kidneys may increase in quantity coincidently with a universal increase of the fat of the body, or it may become hypertrophied by itself; in the latter case it may increase to such an extent as to force its way into the hilus of the organ, impede its nutrition, and cause a fatty infiltration of the kidney, accompanied by anæmia and pallor. It appears that rare cases of this description have been occasionally taken for Bright's disease, and this has given rise to the latter being thought analogous to fatty liver. When it has advanced to the highest stage, the kidney presents the appearance of a mere piece of fat surrounded by a mass of adipose tissue, and without the slightest traces of renal organization; the urinary passages at the same time are atrophied and obliterated.

Independently of universal adipose deposit, we find a larger or smaller excess of fat enveloping the kidneys of old people, accompanied by atrophy of the organ; it also accumulates when the kidney is affected by moderate but lasting inflammatory irritation, especially that caused by calculi, and in secondary atrophy, and obliteration of the kidney.

2. *Perinephritis.*—This comprehends inflammation of the tunica albuginea and of the fascia adiposa of the kidney. It results from wounds, concussion, and urinous infiltration, and accompanies both the inflammation of the kidneys and that of the pelves and calices.

Inflammation of the tunica albuginea is characterised, as we have already had occasion to state, by development of the vessels of the cortical substance, by congestion and softening, succulence and condensation of its tissue, and by the facility with which it may be detached. It is always combined with inflammation of the cortical substance of the kidney. It is only when the latter terminates in suppuration that the disease in question has a similar issue; but it frequently leaves a fibroid thickening of various degrees, combined with induration, atrophy, and obliteration of the kidney, resulting from inflammation of the organ.

Inflammation of the fascia adiposa, which is particularly apt to supervene upon the tedious inflammation of the kidneys and their pelves, induced by calculous irritation, has the general characters of inflammation of fatty tissues; it induces condensation and rusty discoloration; atrophy and conversion of the fat into a white or slate-coloured cellulo-fibrous tissue, which forms adhesions with the thickened albuginea and the peritoneum; in some cases suppuration and abscess may ensue.

SECT. II.—DISEASES OF THE URINARY PASSAGES.

§ 1. *Defect and Excess of Formation.*—It is self-evident that where one kidney is deficient, the corresponding portion of the urinary passages must be entirely, or at least partially, absent; but even when the kidneys are present, exceptional cases occur in which the ureters terminate in a cul-de-sac in the vicinity of the bladder, and also in the neighbourhood of the pelvis of the kidney; or we may find, in addition to a perfect ureter, a rudimentary one developed at the bladder; or finally, the apparatus may have undergone an arrest of development, and be very narrow, and have very delicate coats.

If the kidneys are increased in number, the urinary channels are also multiplied; but more frequently the apparent excess is owing to fissure; the calices opening into two or three pelves, which, in their turn, discharge themselves into two or three ureters. In a less marked degree there is a single pelvis, which is divided inferiorly so as to open into two ureters; occasionally, these are also found to form partial subdivisions. This malformation, and particularly the fissured pelvis, which is then found partially detached from the organ, frequently accompanies a defective development of the hilus of the kidney; it also coexists with an elongated state and a transverse division of the kidneys.

The relation of the vesical orifice of the fissured ureters to the bladder varies. They generally coalesce in the neighbourhood of the bladder, or within its coats, so as to form a single channel, which communicates with the cavity of the bladder by a single mouth; they rarely open by separate orifices placed behind one another at one side of the trigonum Lieutaudi.

When the kidney occupies an irregularly low position, the length of the ureter is correspondingly diminished.

§ 2. *Deviations of Caliber.*—The deviations of caliber consist in dilatation of the urinary passages, caused by accumulations of urine, which result from obstacles to its free discharge, and frequently favoured by an inflammatory condition of the mucous membrane, which paralyses the external contractile layer. It will depend upon the position of the impediment whether the dilatation affects a larger or smaller section of the apparatus. If the former occupies the vesical orifice of the ureter, the entire ureter, the pelvis, and lastly, the calices, become gradually dilated; it is evident, as we shall subsequently examine more fully, that more distant impediments, as, for instance, those placed in the urethra, must also induce dilatation.

The degree in which the dilatation occurs is very various; the higher degrees offer on their own account, as well as on account of various consecutive anomalies, numerous points of interest. Dilatation of the pelves and calices, by exerting pressure upon the renal substance, induces atrophy of the latter. The papilla is first reduced; it becomes condensed and coriaceous, and gradually disappears in the arch of the expanded calyx; the superimposed renal tissue at the same time diminishing in thickness, becoming denser, and assuming a leathery toughness. At an advanced stage the substance of the kidney may be only one, or a few, lines in thickness, and even disappear altogether, being converted into a mere membranous sac (hydrops renalis, Rayer's hydronéphrose), with an external lobulated appearance, presenting cells within, and filled with a urinous, variously sedimentary fluid, or with clear serum; the loculi may intercommunicate with one another, in consequence of atrophy or rupture of the contiguous parietes. These sacs sometimes attain, especially in cases which are unaccompanied by inflammation, the size of a child's or an adult's head; but there is no doubt that, after the urinary secretion has ceased, in consequence of atrophy of the renal tissue, and especially of previous inflammation, they may be reduced.

Dilatation of the ureters exhibits every possible degree; the ureter may even attain the size of the small intestine. It is then found hypertrophied, inasmuch as its parietes not only present the average but even increased thickness; and as it is increased in length, and consequently, instead of being straight, appears coiled or bent. At the same time the dilatation is not uniform, as certain portions of the ureter are narrower than others, the external cellulo-fibrous tissue accumulating at these points during the dilatation, and offering resistance. To this fact, also, is owing the peculiar direction the ureter assumes, as the curvature or flexure always occurs at these spots. It may also be observed that the tube rotates upon its axis at these points, a circumstance which further adds to the diminution of its caliber, and offers a new obstacle. The parietes of these cavities and canals always bear, as we have already remarked, that proportion to the dilatation, that they must be considered hypertrophied; they only attain a remarkable and extravagant thickness, however, if there is concurrent inflammation.

The following circumstances may induce the occurrence of dilatation: Compression of the ureter at different points by morbid growths, by the impregnated uterus, especially by cancer of the womb which extends to the bladder, by fibroid tumours of the uterus, by enlarged, and particularly by dropsical, ovaries, by accumulation of urine in the bladder itself, or by lasting contraction of the bladder consequent upon hypertrophy of its coats;—contraction of the ureter from tumefaction of its coats, consequent upon inflammation and its results;—obliteration of the ureter, and obturation of the calices, the pelvis, and ureter by calculous concretions;—cancerous growths forcing their way inwards from without; and, finally, numerous morbid conditions of the bladder, the prostate, and the urethra, which impede the discharge of the urine into the bladder, or the evacuation of the latter.

These dilatations are consequently generally acquired in advanced life, though in the case of original occlusion (blind termination) of the urinary passages they may be congenital.

In a particular case that we have observed, the pressure exerted by an irregular branch of the emulgent artery, of one line in diameter, that descended from the upper end of the hilus, so as to form an arch over the convoluted transition of the pelvis to the ureter on the right side, caused a dilatation of the former.

The contractions of the urinary passages are sufficiently explained in the above; they are also the result of renal atrophy, and may amount to complete obliteration and closure of their caliber.

§ 3. *Anomalies of Position.*—As a congenital anomaly, we mention the detached position of the single or multiplied pelvis of the kidney accompanying an imperfectly-developed state of the renal labia, and especially occurring in cases of anomalous formation and position of the kidney: acquired anomalies of position are brought on by pressure exerted upon the ureter by irregularities of the neighbouring organs.

§ 4. *Anomalies of Texture.*—1. Inflammations of the urinary passages have to be first mentioned, and especially—

a. Catarrhal inflammation, both on account of its frequent occurrence, as on account of its consequences and its transition to the substance of the kidneys. As a primary disease, it appears in the shape of inflammation of the renal pelvis and the calices (pyelitis), with inflammation of the kidney, as may be gathered from the description of nephritis and Bright's disease; it may be secondary, owing to irritation exerted by accumulation of urine and urinary concretions on the mucous membrane of these parts (pyelitis calculosa); and it may also be and very often is metastatic, the inflammation of the bladder being transferred to the ureters, the pelves, and calices.

It is either acute, as in the case of complication with acute nephritis, or more commonly chronic, being entertained by lasting and repeated noxious influences, or being the result of a chronic morbid process in the bladder, in which case we meet with temporary acute exacerbations. It is of extreme importance, and renders the following details necessary.

The characters are, in proportion to the degree of intensity and duration, a dusky reddish or brown-red congestive state, similar or ashy discoloration in the shape of solitary spots or islands, or of extensive connected patches, tumefaction and villosity of the mucous membrane, and secretion of a yellow puriform mucus, blennorrhœa.

The longer the inflammatory condition lasts, the more the gradual dilatation of the urinary passages, with hypertrophy of the membranes, increases, both in consequence of the paralysis of the external contractile and irritable layer as from the accumulation of the renal and the morbid mucous secretion.

At an advanced degree, as in the temporary exacerbation of chronic inflammation, the mucous membrane, particularly when subject to irritation by gravel and calculi, which chiefly affect the calices and pelves, appears of a saturated red colour, considerably swollen, spongy, and friable; a purulent, more or less sanguineous, fluid is secreted (superficial suppuration), the surrounding cellular and adipose tissues are traversed by varicose vessels, and infiltrated. We find that moderate catarrhal inflammation of the ureters gradually extends to the kidney in the shape of chronic inflammation; it equally attacks the kidney with tumultuous symptoms as acute inflammation when it has reached this advanced degree, and thus proves fatal.

The above-mentioned high degree of inflammation is also found to pass into suppuration of the urinary passages, which spreads from the calices to the tissue of the kidneys, and causes in the latter the formation of abscesses or extensive ulcerative destruction, occasionally urinous infiltration of the renal parenchyma, gangrenous ulceration, and gangrene of the calices and pelvis. We thus find it gradually proceeding in the ureters to perforation, slow infiltration of urine in the adjoining tissues, inflammation, suppuration, necrosis, and in fortunate cases, formation of circumscribed abscesses with indurated parietes.

In these various conditions, the urinary passages contain an alkaline urinous fluid of a pungent odour, which is variously discoloured; it is mixed up with puriform mucus or true pus, sanies, blood, and portions of broken-up tissue, and it frequently deposits a sedimentary incrustation upon the inflamed mucous membrane.

In rare cases the advanced stages of the disease terminate favorably in obliteration of the urinary passages. After the cessation of the urinary secretion, consequent upon complete atrophy of the renal tissue, from pressure exerted by the dilated renal calices, or more frequently consequent upon the coexisting chronic inflammation of the kidney, the tissues contract, the parietes become thickened, and the caliber of the passages is gradually reduced, till complete obliteration results. The fluid contained in the cavity of the calices, which consists of blennorrhoic mucus, pus, and urine, the latter being strongly impregnated with alkalies, salts of lime, and particularly with phosphates, first causes an incrustation on the parietes of the calices, and then becomes inspissated, so as to form a grayish or yellowish-white, greasy, and chalky pulp, which fills the calices; the kidney thus presents the appearance of a loculated cyst, the compartments of which contain the pulp, and radiate from the hilus to the circumference. This pultaceous substance is in due course converted into a dry mortar-like, gritty, dense, calculous mass, and the tissues contracting at the same time, the sac is reduced, the kidney and the efferent channels are obliterated. Occasionally this metamorphosis is observed to take place in one or more detached calices.

Occasionally laminated, corded, nodulated, and amorphous bony concretions are formed in the membranes of the renal calices and pelves, after these have been previously converted into a fibroid or cartilaginous tissue by the inflammatory process; the same may occur in the ureter, though we have not observed it ourselves.

b. Exudative inflammation.—This is on the whole an unusual occurrence, and as far as we are able to judge, invariably a secondary affection; we have never met with a case of idiopathic croup of the urinary organs. It is found complicated with products of the most various plasticity, following typhus, exanthematic diseases, more especially variola and scarlatina, exudative processes in other tissues, as diphtheritis and acute tuberculosis, and purulent infection of the blood; it is very frequently the consequence of extreme disorganization of the blood (especially the so-called status putridus), and then appears as hemorrhagic exudation with purple or dark-red discoloration, sanguineous infiltration, friability and solution of the mucous tissue, and hemorrhage. It may extend over a large surface, or be confined to isolated spots, and it not unfrequently implies gangrene.

2. *Morbid growths.*—*a.* Fibroid tissue and calcareous concretions result from chronic inflammation of the urinary passages in the manner above described.

b. Cysts appear to be more frequent in the urinary passages than they are in and upon other excretory ducts. Without referring to older cases, we may notice two that have been observed in the Vienna Hospital. They represent cysts of the size of millet seeds or peas, developed under the mucous membrane, and either grouped together or solitary, containing a colourless or yellowish serous fluid, in which is found a soft glutinous or hard nodule, varying in size, and resembling amber or horn; these cysts and the mucous covering occasionally burst, which is proved by the concretions having been discovered unattached in the bladder. They were found chiefly occupying the ureters, and in one case the pelves and calices of the kidneys.

c. Tubercle.—This occurs as tubercular affection of the mucous membrane, and is always a symptom of tubercular disease that has spread from the male genitals to the urinary organs. The earlier stages and the chronic course of the disease are marked by gray millet-sized granulations in the submucous cellular tissue, which speedily become yellow, soften, and after perforating the mucous membrane within a ring of reactive inflammation, give rise to small circular ulcers, which but rarely enlarge to the dimensions of a pea or a bean. When the disease sets in with great violence, the mucous membrane is attacked in larger sinuous or annular patches, or becomes infiltrated throughout with the tubercular product of inflammation, which is at once detached as a cheesy purulent mass. The mucous membrane is, under these circumstances, converted into a thick, yellow, fissured, and purulent layer, the external cellulo-fibrous layer of which presents a lardaceous character; the caliber of the canal is enlarged. At those parts which are not affected by this degeneration, we not unfrequently find numerous aphthous erosions resembling those observed in pulmonary and laryngeal phthisis.

Tubercular suppuration occasionally passes from the pelvis of the kidney to its parenchyma, and it here not unfrequently meets with softening tubercles, or even with tubercular abscesses.

d. Cancer.—Cancer occurs very rarely as a primary disease of the mucous membrane of the urinary passages, and never except in company with one or several cancerous formations in other organs already in a process of development; in these cases it affects the calices and pelvis of the kidney, and chiefly assumes the medullary or fungoid form.

The parietes of the urinary passages are very often involved in a secondary degeneration by the encroachment of cancerous growths from without; the calices and pelves being attacked by carcinoma of the kidney, the ureters by cancer of the uterus. Their cavities are narrowed by the cancerous products, and even entirely closed up.

SECT. III.—ABNORMITIES OF THE URINARY BLADDER.

§ 1. *Defect and Excess of Formation.*—Arrest of development occurs in various forms and degrees.

Complete defect is a very rare occurrence; we may meet with it accompanying a very imperfect development of the kidneys, with absence of the urethra, and commonly also as a complication of formative defects of other organs. If, under these circumstances, the ureters are well formed, they open at the navel into the rectum or the vulva.

Occasionally the bladder is very small, whilst the other portions of the urinary apparatus are of normal size: its parietes are then imperfect; it is, in fact, represented by a delicate mucous bag, a mere dilatation of the ureters.

The various fissures of the bladder are other forms of arrest of development. We allude, first, to the very rare cases of fissure or division of the bladder by means of a perfect or an imperfect partition in the median line, the so-called double bladder. That variety of this species of defect is much more frequent, which has been termed, from its appearance, ectrophia or inversion of the bladder. It is the result of a fissure, or a defect of the anterior vesical parietes, and is not unfrequently associated with fissures of adjoining viscera in the mesian line. It is more particularly accompanied by a defect of the symphysis pubis—in the female sex, by absence of the anterior commissure of the labia and the clitoris; in the male sex, by fissure of the urethra on the dorsal surface of the penis or epispadiasis. In the case of inversion of the bladder, we find in the hypogastrium, immediately beneath the navel, which is always placed very low, a red, mucous, dilated spot, the edges of which coalesce with the common integument: in the male sex it passes downwards, so as to terminate in the fissure of the urethra; in the female it is surrounded by two diverging tumours which represent the labia, and it terminates in the lamina of the general integument which invests the rima vulvæ. The ureters open upon this mucous surface, and their orifice is generally found at the inferior half.

The exposed vesical mucous membrane and, owing to the constant stillicidium of urine from the ureters, the neighbouring cutaneous surface, become irritated, reddened, and excoriated. In a very old preparation taken from an adult, which has been transferred from the Anatomical Museum of the University to the Pathological Collection, I find the former in a state of fungoid degeneration.

When the fissure of the urinary bladder occurs in an opposite direction, and is accompanied by fissure of the genital cavities and the rectum, we obtain the formation of cloacæ in their various degrees. The urachus may remain patent to a certain distance from the bladder, or throughout its entire extent.

We have also to allude to defective development occurring in the shape of unusual contraction of the vesical orifice, or atresia vesicæ.

In biventral monsters, the bladder is found more or less completely double.

§ 2. *Deviations of Size and Form. Hypertrophy and atrophy of the bladder.*—With the exception of the above-mentioned congenital smallness of the bladder, and the rare congenital dilatations of the organ from contraction or atresia of the urethra, the anomalies to be classed under this head are all acquired; they are the conditions of permanent and excessive dilatation and contraction.

Dilatation of the bladder is seen under various forms. It may be uniform and general, and in solitary cases attains such an extent, that the bladder is represented by a fluctuating paralysed sac, with relatively thickened parietes, filling the entire pelvis and hypogastric region. It is caused by accumulation of urine, consequent upon insensibility and paralysis of the bladder, but more particularly by mechanical obstacles in the neck of the bladder and in the urethra; in the last case especially, that extreme degree is developed which is always accompanied by hypertrophy of the parietes.

Dilatation of the ureters is a consequence of this affection; it proves fatal by inflammation resulting from the influence of the stagnating and decomposed urine upon the mucous membrane, by the consequent suppuration and gangrene, and especially by peritonitis.

Dilatation occasionally affects in a greater or less degree certain portions, or predominates in certain directions; thus we find lateral expansions at the fundus vesicæ, and saccular indentations produced by the pressure of calculi at or posterior to the triangle of Lieutaud.

An important variety of partial vesical dilatation is presented to us in the hernial dilatation, or acquired diverticulum of the bladder. It is always developed in a bladder the muscular coat of which is hypertrophied, and this hypertrophy, being accompanied by increased irritability of the bladder, affords an evident and intelligible explanation for the predisposition. The vesical mucous membrane insinuates itself between the fissures left by the rounded or hypertrophied fleshy columns, is gradually forced through them, and forms saccular appendages to the bladder, which increase by degrees, and attain a size varying from that of a walnut or hen's egg to that of a fist or a human head. Their cavity at first communicates with the bladder by means of an elongated rhomboidal opening, and the more they increase, the more the latter, being enlarged at the same time, is converted into a round sphincter.

These diverticula occur principally at the lateral portions and near the vertex of the bladder; they are also found at the posterior surface, and may frequently be seen at all these points at once. The diverticulum is very rarely developed in the triangle near the perineum. Its parietes are formed of the mucous membrane of the bladder which, under certain self-evident circumstances, is invested by the peritoneum. Sometimes a few muscular fibres traverse the diverticulum, which circumstance may cause it to be viewed as congenital.

If there happens to be concurrent calculous disease of the bladder, the diverticula acquire additional importance as the calculi may pass into them, or be formed within their cavity, and either be firmly grasped or float unattached. The mucous membrane of small diverticula is frequently the seat of chronic inflammation causing a muco-purulent secretion, and followed by ulcerative perforation and the formation of sinuses between the vesical coats; these sinuses traverse the trabecular structure of the muscular coat in the most various directions.

Permanent contraction of the bladder occurs in various degrees as a consequence of enduring irritation, e. g. by a calculus; or of increased irritability of the mucous membrane from inflammation. The longer these influences last, the more the parietes increase in thickness and hardness, so that they not unfrequently present the appearance of a ball contracted to the size of a duck's or hen's egg.

The contraction is at times partial, and may then give rise to a permanent coarctation of the bladder at one or even at several points. The bilocular vesicæ, noticed by ancient anatomists, probably took their origin in a morbid contraction of this nature.

As regards the diameter of the vesical parietes, we pass over numerous morbid conditions which give rise to thickening, and which will be investigated subsequently, and have now to examine the states of hypertrophy and atrophy.

Both are most apparent in the muscular coat; hypertrophy of the mucous membrane is chiefly seen in connexion with chronic congestion and catarrh of the bladder, and we shall examine into it more fully in speaking of these affections.

Hypertrophy of the muscular coat takes place in consequence of catarrhal affections of the vesical mucous membrane; of repeated and enduring irritation, especially from urinary concretions; of excessive efforts made to overcome obstacles to the discharge of the urine. The latter may affect either the neck of the bladder or the urethra, and be caused by the pressure exerted upon these parts by enlarged or dislocated organs in the vicinity; as by prolapsus, tumours and degenerations of the uterus, uterine, vaginal, and rectal cancer, by the enlarged prostate, strictures of the urethra, &c. The muscular fasciculi are found thickened, so as to form rounded trabeculæ, which project from the inner surface of the bladder in the shape of a trabecular network, comparable to the inner surface of the right ventricle of the heart (*vessie à colonne*), the mucous membrane insinuates itself within its meshes, unless the bladder be permanently contracted, and finally forces its way through them in the shape of diverticula.

The bladder is at the same time either dilated, or if the irritability of the mucous membrane is increased, it is contracted. In the latter case especially, the entrance of the urine from the ureters is variously impeded, and thus a dilatation of the urinary passages ensues.

We must, however, be cautious not to mistake a bladder with thick walls, which is perfectly contracted after it has been completely emptied, for a case of hypertrophy.

Atrophy of the vesical parietes occurs rarely. The mucous membrane may be reduced to a very delicate, shining membrane, resembling the arachnoid, and the muscular coat disappears, with the exception of a few almost imperceptible pale traces; the contractile power of the bladder ceases, its parietes are in a state of permanent relaxation, soft, thin, transparent, pale, anæmic, and friable. We have twice observed atrophy of the vesical parietes of this description as a substantive disease.

The shape of the bladder is liable to numerous deviations. All the congenital malformations that are connected with the above-mentioned anomalies of development belong to this head, and as acquired malformations, we may mention those accompanying dilatation, especially when effected in one direction, and causing diverticula, those resulting from irregular and constant contraction, and those assuming the cylindrical, cuneiform, or cordate form, in consequence of hypertrophic conditions.

§ 3. *Anomalies of Position.*—These involve the dislocation of the bladder from its normal position, and in various directions, by enlarged neighbouring viscera, and voluminous morbid growths in the pelvic cavity, by contraction and malformation (especially that resulting from mollities ossium) of the pelvis; the dragging down of the bladder by dislocated viscera in its vicinity, especially by the prolapsed uterus, and by large morbid growths in the perineum, the position occupied by the bladder in large inguinal perineal and vaginal herniæ; the intussusception of the bladder in the urethra, and its prolapsus through the latter in females; the eversion of the bladder in consequence of a rupture affecting both it and the vagina.

§ 4. *Solutions of Continuity.*—We class under this head—

1. Injuries of the bladder by means of cutting instruments, including the surgical wounds caused by cystotomy and puncture of the bladder; the contusions produced by the head of the child during parturition, by obstetric instruments, by splinters of bone arising from pelvic fractures, or by concussion received by a fall or a blow; rupture of the bladder accompanied by more or less diffused infiltration of the vesical membranes and the surrounding cellular tissue, and hemorrhage.

2. The very rare spontaneous ruptures of the bladder resulting from excessive repletion and distension of the latter.

In both cases the termination may vary; in favorable circumstances a cure may result; extravasation of urine into the peritoneal cavity and peritonitis, or urinous infiltration of the cellular tissue, with diffuse inflammation, suppuration, gangrene, and under these circumstances commonly a fatal issue, may take place; or if the secondary processes are circumscribed, abnormal openings may be established, and vesical fistulæ form.

3. The ulcerative solutions of continuity occurring from within as well as from without, together with the consequent and frequent constricted or patulous communications between the bladder and neighbouring cavities and channels, the intestinal tube, and particularly the rectum, the uterine and vaginal cavities, abscesses, &c.

§ 5. *Anomalies of Texture.*—Here too the diseases of the mucous membrane are of main interest, as those of the muscular coat are rare in themselves, and when they occur are generally consecutive or secondary. We shall consider them in their proper places.

1. *Hyperæmia of the bladder.*—Besides the congestion existing as a stage preparatory to and associated with inflammation, we find hyperæmia occurring not unfrequently as a result of mechanical impediments to the circulation in the pelvic veins and the vena cava. It is commonly complicated with hyperæmia of the neighbouring pelvic viscera, of the rectum, the uterus, and the vagina; it gives rise to a more copious secretion of mucus in the bladder, to hypertrophy of the mucous membrane, and is followed by a permanent dilatation of the vessels, and habitual congestion. The condition accompanying stases in the

hemorrhoidal vessels of the rectum, in the shape of vesical hemorrhoids, is one of this nature.

Extravasation or apoplexy of the vesical membranes, and hemorrhage into the cavity of the bladder, as a consequence of hyperæmia, is a very rare occurrence. Even in those rare cases it is always limited to a few small spots, and they must be carefully distinguished from the dark red suffusions of the vesical mucous membrane, into which the hyperæmic condition which is followed by secondary exudative processes and gangrene frequently degenerates.

2. *Inflammation.* *a. Catarrhal inflammation.*—This occurs in the acute form, but more frequently as a chronic affection; it is commonly presented to the morbid anatomist in the latter shape.

Both generally offer the symptoms common to catarrhal inflammations. Relatively to the chronic form, we have the following observations to make:

It may be developed gradually in consequence of repeated attacks of acute inflammation, or be left as a residuary affection after the incomplete cure of the latter; or, as is very frequently the case, catarrhal inflammation results from an extension of gonorrhœal catarrh to the bladder. It may also be induced by the continued irritation of long-retained and decomposed urine, as is the case when the discharge of the urine is impeded; or lastly, by the irritation arising from calculi.

It offers various degrees; from a pale circumscribed redness, occasionally surrounding the crypts only, slight opacity and thickening, increase of villosity and secretion of a grayish-white liquid mucus, to a dark reddish-brown, slaty or blueish-black discoloration, accompanied by considerable spongy tumefaction, and the secretion of mucus, which is partly vitreous and clotted, partly yellow and puriform (blennorrhœa). The longer the disease lasts, the more the mucous membrane, from its increased irritability and from the permanently increased innervation of the muscular coat, becomes hypertrophied; the cavity of the bladder is diminished in consequence, and if this condition attains a certain point, paralysis of the muscular fibres and consequent dilatation of the bladder ensue.

In this secondary condition, after the affection has lasted a considerable period, a rapid exacerbation of the chronic catarrh is frequently brought on by the irritation exerted upon the vesical mucous membrane by the accumulation of decomposed alkaline urine. The inflammation speedily attains a high degree, and terminates in exudation, fusion of the mucous tissue, suppuration, and gangrene.

Under these circumstances the bladder is found dilated, and filled with decomposed, intensely alkaline urine, mixed up with blood of a brown colour, viscid mucus and pus, sanies, lymph, and detached portions of mucous tissue in the shape of discoloured flocculi or larger patches. From this liquid, which offers a pungent ammoniacal odour, a soft, pulverulent, mealy sediment, consisting of calculous matter bound together by lymphatic exudation, is deposited upon the internal surface of the bladder. The parts themselves are discoloured, and present a dark reddish-brown, greenish-gray, or bluish-black hue. The mucous membrane, when presenting a dark-red colour, appears spongy, softened, and pultaceous, is easily detached and bleeds; when chocolate-coloured or greenish it is found purulent, infiltrated with sanious matter, or converted into a friable flocculent tissue, which is traversed by the urinary sediment; or if the process of solution is completed, and the mucous membrane has become detached, the surface of the cellular and muscular coats is exposed in larger or smaller sinuous patches, appears frayed and pulpy, infiltrated with purulent sanies, discoloured, softened, and friable. Finally, the muscular coat is involved in the suppurative and gangrenous destruction, and general peritonitis ensues; or even before this takes place sinuses are formed between the vesical membranes, the parietes of the bladder are eaten through, and present a cribriform appearance, and the urine exudes into the surrounding cellular tissue and into the peritoneal cavity. The bladder is converted into a paralysed sac, the coats of which are thickened, though they yield on slight pressure, they are discoloured, and infiltrated with pus and sanies.

The disease commonly proves fatal, either directly or by extension of inflammation to the ureters and kidneys.

In other cases the disease has slight exacerbations from time to time, being limited to a more or less circumscribed spot, which undergoes a slower process of suppuration, and at last becomes perforated. If, under such circumstances, the tissues external to the bladder have become the seat of inflammatory action previous to the occurrence of perforation, a diffuse extravasation of urine is prevented in one direction by inflammatory condensation of cellular tissue—in another, by free peritoneal exudation and agglutination to an adjoining organ. The circumscribed suppuration progresses slowly, and induces fistulous destruction of the tissues, and communications between the bladder and the external surface of the body, or with other hollow organs.

Catarrh of the bladder is of importance, under all circumstances, from its extension to the ureters; and, in bad cases, from its complication with renal inflammation. It may also extend to the seminal ducts.

A very important variety of vesical inflammation is that developed in the course of paraplegia; it generally passes into gangrene, and terminates fatally. The mucous membrane becomes the seat of extensive congestion and suffusion, which spread to the submucous cellular tissue and the muscular layer; the bladder assumes a dark red hue, is friable, dilated, and filled with urine; or it is empty and collapsed, and the mucous membrane is then partly invested with a coat of ill-looking lymph, partly infiltrated with pus, partly fused into a pulpy sanious tissue. The muscular fasciculi are pallid, ash-coloured and friable, and the cellular tissue is infiltrated with pus and sanies. The cavity of the bladder contains a sanguineous, dirty brown, or chocolate-coloured urine, of a pungent ammoniacal odour; this is mixed up with the various products of the process, and deposits a white, soft, pulverulent sediment.

This affection presents an extremely asthenic character, and although we are ready to admit that in many cases it originates, together with the concurrent inflammation of the kidneys, in paralysis, we consider that in others the irritation produced by the alkaline urine stagnating in the bladder, is to be viewed as the chief or as a collateral cause.

b. Exudative processes.—Primary croup of the vesical mucous membrane is extremely rare; but secondary exudative processes are by no means as unusual as is commonly thought. The latter occur during the course of exanthematic diseases, especially of scarlatina and variola, during typhus as a symptom of an anomaly and degeneration of the typhous process, in consequence of absorption of pus in the blood, and associated with exudative processes in other mucous membranes.

The affection gives rise to a more or less coagulable fibrinous exudation of varying thickness, or to a viscid, gelatinous, discoloured, purulent or sanious product; it rarely involves the entire bladder, or even a large portion of it, but is generally limited to round spots or striæ. The mucous membrane presents the most various degrees of injection and redness, varying from an almost imperceptible change to complete saturation of some portions, with considerable thickening and tumefaction, and an induration proportionate to the coagulability of the deposit. According to the character of the process, the diseased tissue becomes softened and converted into a pale or dark red, reddish-brown pulp, or a gelatinous, purulent, or sanious mass; the local process not unfrequently assumes a gangrenous character, and the tissues are then resolved into a putrescent sanies, or become detached in the shape of an eschar.

As the exuded matter coagulates, it not unfrequently takes up urinary sediments, or these are subsequently deposited and give rise to an incrusted appearance of the coagula or of the bladder.

We see the typhous process occurring in the vesical mucous membrane under various forms:

α. It is rarely presented in the genuine shape, i. e. characterised by a product resembling that formed in the intestinal follicles and in the mesenteric glands.

β. It is frequently met with as a degenerate exudative process in the shape of scattered, insulated and soft exudations.

γ. It is seen degenerated to an exudative process resembling a gangrenous eschar. Opportunities of observing the complete metamorphosis of the products and their subjacent strata, in the shape of softening, fusion and separation, are but rarely offered, as the general disease commonly proves fatal prior to these events.

c. *Pustular inflammation.*—We advert to the rare formation of variolous pustules upon the authority of other observers. We have ourselves not seen pustules in the bladder, even in cases in which the urethral mucous membrane was intensely affected by the variolous disease.

We may at the same time mention the occurrence of small millet-sized vesicles containing a clear serosity, and resembling a miliary eruption; they accompany catarrhal inflammation and slight exudative processes in the vesical, in the same manner as in other mucous membranes, and are noticed chiefly at the fundus and neck of the bladder. It is also an interesting fact that we have found them in many cases of Asiatic cholera, accompanied by painful dysuria, for which alkaline fomentations afforded considerable relief.

d. Pericystitis.—We have already alluded to the more or less diffused inflammation of the cellular tissue surrounding the bladder, which supervenes upon intense inflammation of the muscular coat and suppuration of the bladder (vide p. 225), or is the result of infiltration of urine after accidental or intentional wounds of the bladder, of ulcerative perforation, and of an extension of inflammation from adjoining cellular structures; but we have besides these a spontaneous inflammation of the cellular tissue surrounding the bladder, which is designated as *pericystitis.* Like the inflammatory, suppurative, and gangrenous processes of the subcutaneous cellular tissue, or of the cellular tissue surrounding the cæcum or rectum, it may be idiopathic, though it is more frequently a secondary process; it is to be considered as a localization of pyæmia, which was either spontaneous or dependent upon an absorption of pus, or of a degenerate typhous or anomalous exanthematic process. It spreads with facility through the cellular tissue of the pelvis, to the cellular septum of the rectum, to the anus, and into the scrotum; it attacks the submucous tissue of the bladder, and having passed into suppuration and necrosis, causes an exfoliation of the mucous membrane and perforation of the vesical parietes.

The affection is sometimes of a chronic nature, and then gives rise to induration, callosity, and rigidity of the bladder.

3. *Gangrene of the bladder.*—Gangrene is the result of intense inflammation, brought on by the contact or imbibition of anomalous urine in the affected tissues, in which cases it assumes the appearance of sphacelous fusion (vide p. 225); or it results from contusion, and then we find an eschar formed (vide p. 227).

4. *Softening.*—Besides the fusion of the mucous membrane accompanying the exudative process, we have but once observed a gelatinous softening of the vesical mucous membrane. It

occurred in a case of typhus which had reached the ulcerative stage, and the bladder was found to contain a large quantity (three pounds) of putrescent urine.

5. *Adventitious growths.*—*a.* We have never observed the formation of cysts between the coats of the bladder, or in its mucous membrane, though from their occurrence in the ureters, pelvis, and calices (vide p. 216), we are not inclined to dispute the possibility of the former. We have to remark that the accounts of a discharge of hydatids or acephalocysts from the bladder for the most part depend upon a descent of these growths from the kidneys, or from other organs (e. g. the liver), that have formed adhesions with the urinary passages, to the bladder, from which they are eliminated.

b. Tubercle.—Tubercle of the vesical mucous membrane is a very rare occurrence, and is not even always found as a complication of tubercular affection of the urinary apparatus, which, as we have already seen, is combined with and results from tuberculosis of the sexual organs. When it presents itself on the vesical mucous membrane, it is commonly also associated with tubercle of the urethra and prostate gland.

It assumes the form of discrete granulation only, and is deposited with more or less reaction and vascularity, under the mucous membrane; it becomes softened with greater or less rapidity, and after perforating the mucous membrane within a vascular area, leaves a small circular ulcer. According to our observations, and owing probably to the rapid development of the tubercular disease in the other segments of this and the sexual system, as well as to the high degree of the universal cachexia, secondary tubercular deposition and secondary enlargement of the tubercular ulcer in the bladder, are found to be very unusual. The cervix and fundus of the bladder are the main seat of tubercle; we sometimes however notice that the bladder is involved in secondary tubercular ulceration by an extension of the disease from the prostate gland.

c. Carcinoma.—The bladder is either attacked primarily by cancer, or the disease is consecutive, having spread from neighbouring organs, especially the uterus, the vagina and the rectum. The latter is by far the more common case.

We have observed the following varieties of cancer:

a. Fibrous cancer occurs but rarely in the shape of cancerous degeneration of the vesical membranes with thickening, cartilaginous induration, and the characteristic metamorphosis of the muscular layer; we have seen it spread over large surfaces, at the side of the bladder, both upwards and downwards, accompanied by carcinomatous degeneration of the female urethra.

β. Medullary cancer occurs in the shape of nodulated morbid growths between the coats of the bladder, and is commonly associated with cancer in the adjoining sexual organs of the female, and with cancer of the rectum. It perforates the mucous membrane, and occasionally gives rise to a characteristic carcinomatous ulcer with raised edges.

γ. The most frequent form of cancer occurring in the bladder presents the appearance of soft, furred, cauliflower-like, vascular, and generally bluish-red vegetations, which bleed on the slightest touch, and are attached by a rounded flattened peduncle; they arise from the mucous membrane and the submucous cellular tissue with delicate fibres, and develope a very fine membranous tissue, within which a whitish or reddish-white, creamy or medullary (encephaloid) mass is formed. They are either isolated or grouped together, and at last coalesce so as to form a very large, loose, fissured, succulent, globular mass (fungus) which fills out the bladder in proportion as the latter becomes hypertrophied and contracted, in consequence of the permanent irritation. They chiefly occupy the neck and fundus, the trigonum and the parts near the urethral orifices; they are sometimes spread over the entire inner surface of the bladder, but they generally make their first appearance at the above-named spots, and it is there too that the large fungoid growths are found. Of several cases we may mention one in which these vegetations occupied and nearly filled the cavity of a diverticulum of the size of a duck's egg, which descended from the fundus of the bladder to the rectum and perineum.

The more they are developed, the more they are liable to produce considerable hemorrhage from their extreme vascularity; with consequent cachexia and exhaustion; they are occasionally found inflamed, covered and interlaced with lymphatic exudation, and gangrenous.

This variety of cancer is frequently complicated with cancer in other organs; it is especially allied to the cauliflower excrescences occurring upon anomalous serous and fibro-serous membranes, and upon the inner surface of the compound cystoidea or of the peripheral follicles of areolar cancer that have been converted into large sacs; as also to erectile tumours or epithelial formations on other mucous membranes.

SECT. IV.—ABNORMITIES OF THE URETHRA.

§ 1. *Defective Development.*—The urethra is absent in those rare cases in which the entire uropoietic system is wanting, as also in those in which the bladder is deficient; it is also wanting in those cases in which there is a partial deficiency of the bladder, as in cases of fissure, of ectrophy in the female sex, and of cloacal formation. The urethra may be imperfectly developed, presenting on the upper (epispadiasis) or lower (hypospadiasis) surface of the penis, a fissure which extends either along its entire length, or only to a short distance from the external orifice; fissure of the entire dorsal surface of the penis occurs as a complication of eversion of the bladder, that of the inferior surface with fissure of the scrotum. The latter malformation causes a resemblance to the vagina. In other cases a portion of the urethra is deficient, and the latter then terminates in a cul-de-sac, placed at a greater or less distance from the usual point of the orifice in the glans penis; total absence of the urethra equally gives rise to an imperforate penis.

The urethra may, in consequence of a congenital arrest of development, not open externally, but communicate with the cavity of the rectum, or in the female sex with the vagina; or vice versa, it may receive the rectum or vagina at the lower or posterior portion of its parietes.

§ 2. *Deviations of Size.*—They affect, with exception of congenital shortness of the urethra, its caliber only. We find a more or less dilated or contracted condition of the urethra occurring in both sexes as a congenital anomaly, and affecting its entire extent or small portions only; it is of especial importance in the male sex.

Dilatations as well as contractions of the urethra, the latter being particularly frequent and important, occur as acquired conditions.

Dilatation affects the entire canal uniformly or detached spots only; this depends upon the locality of a mechanical impediment, and upon the extensibility of various portions of the urethra. The pars membranacea of the male urethra is liable to the largest fusiform and pouchy dilatations; a uniform dilatation of the entire canal is often brought on by the continued use of bougies.

Contractions of the urethra originate in primary, but more frequently in secondary, textural changes of the urethral mucous membrane of the corpus cavernosum and its fibrous sheath, and we shall have to examine them more carefully when speaking of urethral inflammation and its consequences.

Contractions of the urethra are also brought on in either sex by the pressure of morbid growths, in man by the enlarged prostate, in the female by neighbouring organs that have been dislocated, e. g. the uterus, the prolapsed vagina, &c. The passage of the urethra may also be more or less permanently or dangerously narrowed or closed up by products of its own mucous membrane, as well as that of the bladder, e. g. a mucous plug, croupy exudation, renal and vesical calculi, acephalocysts, &c.

§ 3. *Deviations of Direction.*—Among these we reckon the serpentine, angular or inflected, and variously altered course given to the urethra by voluminous herniæ in either sex, by large morbid growths in the vicinity, by the dislocation of neighbouring organs (the uterus) in the female, and especially by the enlarged prostate in man; the latter causes a contraction of the urethra, and pushes it aside, or divides it into two passages, which diverge in the direction of the bladder.

Both the pressure which the urethra suffers, as well as the anomalous direction, and particularly the inflection induced, diminish the caliber of the urethra at various points.

§ 4. *Solutions of Continuity.*—We enumerate under this head, wounds of the urethra, contusions and rupture brought on by a concussion or fall, particularly upon the perineum; rupture produced by the passage of large angular calculi, perforations brought on by rude efforts at catheterization, and ulcerative destruction. In all these cases incomplete recovery

very often takes place, leaving urinary fistulæ of varying extent, length, direction, and course.

§ 5. *Diseases of the Tissues.*

1. *Inflammation. a. Catarrhal inflammation.*—It commonly commences with a more or less acute or inflammatory stage, and subsequently passes into a protracted or chronic (blennorrhoic) stage. It results from chemical or mechanical irritation by substances that have been introduced from without, or it may be developed spontaneously in children from a scrofulous, or in aged people from a gouty diathesis, and in either it may be connected with impetigo;[1] though it has its origin most frequently in gonorrhœal contagion (gonorrhœal catarrh.)

We find the anatomical characters to be those belonging to catarrh generally; in the acute stage there is, according to the violence of the process, redness, injection, tumefaction of the urethral mucous membrane, or secretion of puriform mucus; in the chronic stage there is tumefaction of the mucous membrane, enlargement of the follicles, relaxation of the sinuses, and a white or colourless secretion. The inflammation is either uniformly diffused over the urethra, or is limited to one or more spots. The latter is especially the case in genuine gonorrhœa of the male urethra; we here find not only the navicular fossa, but every point as far as the prostatic portion, and especially the vicinity of the bulb of the urethra liable to become the seat of the disease. When the gonorrhœa is very violent and obstinate, a small tubercular swelling, which results from the deposition of fibrinous matter in the spongy tissue of the urethra, is found at these points of the urethra. This subject has not hitherto received the attention it deserves, either in regard to gonorrhœa itself, or in reference to the pathology of stricture consequent upon gonorrhœa, and to the gonorrhœal ulcer of the urethra.

The terminations and consequences of gonorrhœa are various. The most common result, which is caused by great violence of the affection, by improper dietetic and therapeutic treatment, and by repeated attacks, is condensation and hypertrophy of the submucous tissue, fusion of the latter with the mucous membrane, and conversion of the corpus cavernosum into a white, resistent, fibrous, cartilaginous tissue. The entire urethra sometimes undergoes this metamorphosis, subsequent to repeated and mismanaged attacks of gonorrhœa, but more commonly detached portions only are affected, and this gives rise to partial contraction or stricture.

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[1] [See note, p. 10.—Ed.]

Stricture of the urethra occurs in various shapes: the urethra is sometimes contracted to the extent of several lines, the parietes presenting a cartilaginous appearance, and the lining membrane being either smooth or having nodulated projections, or longitudinal folds; sometimes the stricture forms a rounded protuberance or an angular band encircling the entire canal or only surrounding a portion of the circumference; at others, again, it appears in the shape of an irregular cicatrix, which causes the surrounding mucous membrane to be puckered up.

The strictures may be solitary, or after a recurrence of gonorrhœal attacks, there may be two, three, four, and more. Their seat corresponds to the seat of the previous inflammation. We have a unique preparation in the museum of Vienna, of a urethra of a man who had repeatedly been affected with gonorrhœa; it presents numerous cartilaginous protuberances from the size of a millet seed to that of a pea, in part coalescing and scattered over the inner surface, as far back as the bulb, leaving the passage however of adequate dimensions.

The degree attained by the stricture varies; we not unfrequently find it so excessive, that the contracted part scarcely permits the passage of the finest bristle.

The essential character of stricture consists in the same alterations of this submucous and mucous tissue, which we observe accompanying and following violent inflammation of the mucous membranes when it involves the submucous cellular tissue; it does not bear any specific character. The inflammation attacks the spongy substances of the urethra at those spots at which the diseased action was most developed, and gives rise to a deposit of the fibrinous matter in its meshes, which induces the above-mentioned swellings in the urethra. If resolution does not ensue this product remains, and the corpus cavernosum is converted above it into a wheal, varying in extent, shape, and thickness, and consisting of fibrous and fibroid tissue; this is the more liable to induce a narrowing of the urethra, as it possesses a great tendency to contract, and the liability increases in proportion as the sound layer of the corpus cavernosum diminishes. The stricture is most considerable when the corpus cavernosum is involved throughout its entire thickness. It is evident that when the metamorphosis affects the innermost layer of the corpus cavernosum only, the gonorrhœa may be followed by dilatation of the urethra, and we actually find this to be the case in violent though diffused gonorrhœa.

The stricture, consequently, consists of the corpus callosum urethræ, which is converted into a fibroid callus, with which the mucous membrane, including its epithelial and submucous layer, has become identified. It is in no way related to cancer, and particularly not to so-called scirrhus. However, mechanical irritation frequently brings on excoriation, inflammation of the tissue, and ulceration, which in favorable cases may be put a stop to after the passage of the urethra has been re-established, though it often involves the deeper parts, destroys the urethra, and induces urinary fistulæ.

Strictures maintain a tendency in the urethral mucous membrane to inflammatory attacks, which gradually extend to the bladder, the urinary passages, and the seminal ducts. They also lead to a dilatation of the urethra beyond the contracted part, to dilatation and hypertrophy of the bladder, and dilatation of the ureters.

Those excrescences which are termed warts by medical practitioners, and which are probably polypous or condylomatous growths of the urethral mucous membrane, and which are said to be particularly liable to accompany stricture, are another consequence of gonorrhœa. We have observed them very rarely.

Lastly, we find gonorrhœal inflammation degenerating into ulceration, causing the gonorrhœal ulcer, which has not been as yet sufficiently investigated in the dead subject, and which not unfrequently gives rise to very fine capillary fistulæ.

True polypi, particularly of the female urethra, probably occur as a consequence of repeated and tedious catarrhal affections. I have found them in one preparation in the prostatic portion of the male urethra.

b. Exudative processes.—In very rare cases we find primary croup occurring on the urethral mucous membranes; it induces a circumscribed or a tubular exudation, according to the intensity of the process, and occurs chiefly in children.

In the course of hectic fever, brought on by suppuration in the vicinity, we occasionally see more or less numerous aphthous exudations and erosions on the urethral mucous membrane.

c. *Pustular inflammation.*—We frequently observe variolous pustules in the urethra, when the disease is very intense on the general tegumentary surface. As in other mucous membranes, it is accompanied by an exudative process of varying intensity.

2. *Ulcerative processes.*—Besides the gonorrhœal ulcer, the ulcerating stricture and the ulcerative processes with which the urethra is attacked from without (the prostate), and to which it is more or less exposed in conjunction with the penis, we have to notice the primary syphilitic ulcer—chancre of the urethra. Cicatrices left by ulceration, and especially by the last variety, must be carefully distinguished from gonorrhœal stricture, though this is rendered extremely difficult, as the cicatrix almost invariably induces stricture.

3. *Adventitious formations.*—In addition to the fibroid tissues occurring after gonorrhœal inflammation, and especially in strictures, to the problematic carunculæ or warts of the urethra, we find that tubercle and tubercular ulceration (Tuberculosis urethræ) are formed in the urethra, though only in conjunction with tuberculosis of the entire urinary apparatus. The urethra is also attacked by cancer and cancerous ulceration; in the male sex this accompanies, or is the consequence of, carcinoma of the penis, and especially of the glans.

§ 6. *Anomalous Contents of the Urinary Passages.*—The anomalous contents of the urinary passes are very various, and may be classified as follows:

1. The products of the organic affections of the secretory as well as the efferent apparatus; they are the more intimately mixed with the urine, the nearer the point of their formation is to the place where the latter is secreted, and the greater their capability of suspension and their solubility.

2. The deviations which the urine presents, independent of the first-mentioned admixtures, whether accompanied by a demonstrable disease of the renal texture, or unassociated with any traces of structural disease: they result from an anomaly

in the vegetative sphere, and especially in the blood; they may also occur as a passing effect of certain indulgences, and they relate to the quantity and quality, and particularly to the physical characters of the urine.

In reference to 1, we have to notice:

a. The blood and certain of its component parts. The former (hæmaturia) is found in the urinary passages, to a larger or smaller amount, in the shape of rounded or cylindrical coagula of varying consistency, or mixed with the urine in a fluid condition. It appears in consequence of various injuries involving the kidneys and the urinary apparatus, produced by means of cutting instruments, concretions, ruptures, apoplexy of the kidney, the bursting of an aneurism into the urinary passages, or of varicose veins into the bladder, ulcerative corrosion of a vessel, or bleeding carcinomatous growths in the urinary organs. It results from hyperæmia, nephritis, Bright's disease, hemorrhagic inflammation of the passages, and from disorganization of the blood. Sometimes it is not true blood—blood-globules—but mere hæmatosine, which passes into the urine from the serum in the kidneys. We also find other constituents of the blood, such as albumen and fibrine, in the urine.

Albumen is discovered in the course of numerous diseases both accompanied by and unassociated with renal disease. In many acute diseases, albuminous urine is secreted with an excess of lithic acid, and lithate of ammonia. Albumen is sometimes found with sugar in diabetic urine; it always occurs in hemorrhage into and inflammation of the urinary passages, in hyperæmia, nephritis, &c. It is found to a large amount in Bright's disease of the kidney, frequently mixed up with blood-globules, or hæmatosine. Its presence is demonstrated by milky turbidity of urine, by the urine foaming when air is blown into it, by coagulation of the albumen on the application of heat, the addition of alcohol or nitric acid, &c.

Fibrine is said to have been found in the urine in some cases of dropsy; in the case of hemorrhage into the urinary apparatus it forms coagula of various shapes and sizes, which are easily recognised.

b. Exudations in the urinary passages, assuming the shape of flocculi, laminæ and tubular concretions.

c. Grayish, milky, vitreous, colourless, purulent yellow (blennorrhoic) mucus, pus and sanies, may be intimately blended with the urine, causing it to be variously discoloured or turbid, or forming flocculent concretions, and loose, crummy, viscid, glutinous sediments. Mucus appears in the urine as the effect of acute, but more frequently of chronic catarrhal inflammation of the urinary passages. Pus and sanies are the result of suppuration of the kidneys, with discharge of the abscess into the urinary passages, and of suppuration, and the formation of sanies in the latter; or these fluids reach the urinary cavities from neighbouring organs by ulcerated communications; they may also be the consequence of gangrene, tubercular or cancerous degeneration. We also find in the urine, besides the above-mentioned substances, epithelial lamellæ, tubercular matter, elementary cells of cancer, &c.

d. It is stated that the urine contains a substance resembling cerebral fat, when the kidney is affected with medullary cancer. The immediate condition of this occurrence has not as yet been determined; it is probably essential that the morbid growth should have forced its way into the urinary passages, or that it should project into them.

e. Ancient and modern observers have noticed that hairs are sometimes evacuated with the urine; they may be formed within or external to the urinary organs.

f. Within the most recent period, Curling has discovered a new entozoon, the dactylius aculeatus, in the bladder. A very recent case is also given of the discharge of cysticerci with the urine; acephalocysts are frequently carried into the urinary passages both from the kidneys and from other organs, and are evacuated with the urine.

In reference to 2, we observe that the deviations of the urine, as regards quantity, may consist in excessive or diminished secretion; if the quantity found in the dead subject be small, it is requisite to ascertain the evacuations that have taken place before death; if considerable, the obstacles to its discharge must be inquired into. Urine presents various anomalies as to quality, affecting both its physical and chemical properties.

a. The colour of the urine is either too intense, owing to a large amount of colouring matter, which is generally combined with lithic acid or urea; or it is very pale, and, at the same time, less acid or neutral. The urine assumes a red colour from an admixture of blood or its colouring matter; if there is at the same time an excess of acid, it may become reddish-brown, brownish-black, or in very rare cases, which are probably dependent upon an alteration in the hæmatosine, it may even become perfectly black. Biliary matter produces a yellow, yellowish-brown, or even greenish discoloration. We must finally allude to those anomalous appearances of the urine produced by the consumption of various substances that are rich in colouring matter, as beet-root, madder, rhubarb, gamboge, chelidonium, indigo, ink. The urine may at the same time be transparent or turbid; the latter, in so far as it is independent of the above-mentioned foreign admixtures, is proportionate to the lithic acid or lithate of ammonia contained in acid, or to the phosphates in alkaline urine.

b. The odour of urine is either more or less powerful than in the normal condition; thus the pale watery urine is frequently almost without smell, whereas the saturated urine of acute rheumatism or of pneumonia smells very strongly. Occasionally the urine presents the odour of broth or of whey; in diabetes mellitus it has a spirituous smell, owing to the commencement of fermentation, or its odour resembles that of decomposed straw, of putrid matter, or is very pungent. Different odours are perceived after the consumption of asparagus, turpentine, the balsams, leek, assafœtida, &c. In diabetes mellitus, the urine has a sweet taste.

c. Specific gravity.—This is either above or below the normal standard. It is excessive in diabetes mellitus, and very low in diabetes insipidus. In the chronic form of Bright's disease it is diminished, as the proportion of urea and of the urinary salts is diminished, at the same time that the albumen increases; in the acute form it is not unfrequently increased.

3. As regards the chemical composition of the urine, we find that the normal constituents exist in irregular proportions, or that there are new and unusual substances.

a. The watery portion of the urine is in excess in numerous affections of the nervous system, in hysteria, in diabetes insipidus, and according to Rayer and older observers, in advanced age; its quantity is too small in proportion to the solid constituents in the saturated urine of acute diseases, especially at the period at which critical discharges occur.

b. The urea does not, as was formerly believed, bear a direct relation to the colouring matter of the urine, a fact that has been distinctly proved by Prout in some cases of diabetes insipidus. It is more frequently morbidly diminished, as in diabetes mellitus, in Bright's disease, and numerous other diseases that have not as yet been clearly diagnosed, and in which, as the urea disappears, albumen is substituted.

Original deficiency of urea is to be carefully distinguished from that deficiency which results from its decomposition in consequence of stagnation in the urinary passages, from the influence of mucus, purulent secretion, and pus.

c. Uric acid, either free or combined with a base, and especially in the shape of urate of ammonia, is deposited in the form of small crystals, or of a yellow or lateritious powder. It is increased in quantity in rheumatism, gout, and inflammatory affections; in hysterical urine, in the urine voided during the cold stage of intermittent fever, and in numerous other diseases, it is diminished in quantity. If free acid is present in the urine it may be precipitated in the shape of gravel, though not itself in excess.

d. The phosphates (phosphate of lime, phosphate of magnesia, and triple phosphate of ammonia and magnesia,) are often present in excess. Phosphate of lime is deposited in the absence of a free acid, and phosphate of ammonia and magnesia, as a basic salt: these form the phosphatic sediments. As the latter salt is formed in consequence of the development of ammonia, it occurs principally in urine containing much mucus, pus, seminal fluid, and other animal substances that are easily decomposed. The lithic acid is, at the same time, proportionally diminished, and the urine is neutral or alkaline.

e. The alkaline state of the urine is of extreme importance; in many cases that have not as yet met with a sufficient explanation, it appears to be the result of a morbid secretion, or it depends upon decomposition of the urine, and presents various degrees. The urine in this condition is commonly pale and turbid. It is particularly alkaline in chronic inflammation of the kidney, and in numerous diseases of the urinary passages;

it is so sometimes in a slight degree, and temporarily, in Bright's disease. The alkaline state of the urine in diseases of the spinal cord, in paraplegia, has attracted some attention, and has given rise to the question, whether this alkalescence is the result of a simple derangement of the act of secretion, i. e. whether the urine is secreted as an alkaline fluid; or whether an acid urine becomes alkaline in consequence of decomposition, by means of the products of coexistent cystitis or nephritis. The question has not received a satisfactory reply. Post-mortem examinations have generally demonstrated the existence of the latter series of causes of alkaline urine; the examinations of the urine in living subjects have been either neglected in the class of cases that come under this head, or they have but little value, on account of the insufficient diagnosis of existing inflammation of the urinary passages and the kidneys. The only proofs in evidence of alkaline urine being secreted by the kidneys, are afforded by the vivisections of Krimer and others, in which, after the division of the spinal cord, urine of the appearance of pure water was secreted; and by the clear neutral or alkaline urine passed in hysterical or epileptic attacks. Rayer has found the urine acid in cases of recent paraplegia, unaccompanied by retention of urine.

The following substances are rarely found as constituents of the urine:

α. Purpuric acid, a modification of lithic acid, produced by the presence of nitric acid, and purpurates (purpurate of ammonia and soda), which are said to give a red colour to the urinary sediments (Prout).

β. Hippuric acid (Liebig), which has been found in children in the shape of hippurate of soda, and in diabetes.

γ. Oxalic acid is, according to Prout, the result of a decomposition of lithic acid, and occurs as oxalate of lime, in the form of a greenish or blackish sediment, or of gravel or calculous concretion.

δ. Benzoic, butyric, and cyanic acid, cyanurin and melanurin in blue and black urine, xanthic oxide (Marcet), and cystin (Wollaston).

ε. Sugar, in varying proportions, in diabetes mellitus.

ζ. Cholesterin.

η. Numerous medicinal substances.

The formation of calculous concretions in the urinary organs is a matter of extreme importance; it takes place within the kidneys, in the pelves and calices of the kidneys, in the ureters, the bladder, the urethra, the urachus, and even externally to these passages. The pelvis and calices of the kidney and the bladder are, however, the parts in which calculi are most frequently formed. The latter present considerable varieties, both as regards their physical properties and their chemical composition,

aa. When the concretions are very small they are termed gravel, and may be very numerous or few in number. Gravel may be formed at any part of the urinary apparatus, and even in the kidney. The red variety consists chiefly of lithic acid, the white of phosphates. Calculi are larger concretions, which again differ much as to volume and weight. In size they vary from that of a millet seed to that of a goose's egg, or a fist.

ββ. Vesical calculi are generally of a globular, ovate, or oval form; they are frequently flattened so as to present a discoid or lenticular shape; if two or more coexist, friction planes are formed, giving the calculi when numerous, a polyhedral shape. Large renal calculi are moulded according to the form of their nidus, and assume a branched appearance. In rare cases the calculi are hollow, forming tubular or conchoid concretions. Their surface is either smooth or rough, angular or fissured; or it appears decaying, gnawed, granular, of a mulberry form, or set with sharp, prickly projections, crystalline, &c.

γγ. The number of the calculi present varies; there are generally several renal calculi, whereas vesical calculi are commonly solitary; however, there are cases on record in which fifty, an hundred, nay, several hundred calculi, especially of the phosphatic variety, were found.

δδ. In colour, consistency, and texture, they vary much, and these qualities depend upon their chemical composition.

The substances entering into the chemical constitution of urinary calculi are numerous; sometimes one only forms the calculus or predominates, at others several are mixed up together, or disposed in layers. They are not all equally frequent.

a′. Lithic acid enters into the composition of most calculi, inasmuch as many consist entirely of it, many in part, and as it forms the nucleus of the majority. Lithic-acid calculi are commonly of considerable hardness, smooth, light or dark brown, rounded, and often flattened.

β′. Lithate of ammonia and lithate of soda rarely enter into the composition of calculi. Those consisting of the former are yellow, and of a loose texture; those composed of the latter are white and chalky.

γ′. Phosphate of lime rarely forms a calculus by itself.

δ′. Phosphate of ammonia and magnesia forms small, friable, white calculi, that have a shining crystalline investment.

Calculi consisting chiefly of the two last-named substances and carbonate of lime, are very frequent. They are white, of a loose texture, and often of a considerable size; they are generally formed in consequence of inflammatory affections of the kidneys and urinary passages, which in their turn are frequently induced by the presence of a lithic-acid calculus, or some other foreign body, which serves as a nucleus for the calculous deposit.

ε′. Oxalate of lime forms the mulberry-shaped, nodulated, dark-brown or black, and very hard calculi.

ζ′. Xanthic oxide and cystine are very rare. The latter we generally find combined with fat, resin, colouring matter, iron, silica. In rare cases we also find fibrinous coagula, in the shape of carneous or fibrous elastic masses, entering into the formation of calculi.

Vesical calculi are either contained free and unattached in the bladder, or are firmly grasped by the bladder, which has become hypertrophied in consequence of catarrhal attacks. They are found encysted in hernial diverticula of the bladder, or lie in saccular expansions of the vesical parietes, which they form for themselves during the contractions of the bladder; they sometimes become agglutinated to these and other parts by means of fibrinous exudations.

Urinary calculi offer mechanical obstacles to the conduction and discharge of the urine, and give rise to inflammations of the kidneys and urinary passages, proportionate to the size of the calculi, and the roughness and irregularity of their surface. They are sometimes, even when of considerable magnitude, discharged by the natural passages, especially in the female;

still they more commonly cause severe injuries of the urinary channels, rupture of the urethra, &c. At other times they make their way by inflammation and suppuration into neighbouring cavities, as into the rectum, the vagina, or into abscesses, and from these by unnatural passages outwards.

In very rare cases we find urinary calculi inclosed in cartilaginous capsules external to the urinary passages, having either forced their way out of the latter by rupture or ulcerative perforation, or having been formed at the spot where they are discovered, in urine that has been previously extravasated.

Appendix.—Diseases of the Suprarenal Capsules.

The suprarenal capsules are occasionally deficient, especially when there is a deficiency in other organs also. They are not always absent in acephalous monstrosities; and as their absence generally involves the absence of numerous other organs, the fact suggests no distinct interpretation as to their functions. They are, moreover, generally present when one kidney is absent, and this proves that they are perfectly independent of the kidneys and the sexual organs (Meckel); their diseases place them in a more distinct relation with the lymphatic glands.

The fusion which often occurs in the kidneys is not found to take place in the suprarenal capsules.

Accessory suprarenal capsules indicating an apparent excess of development, are of frequent occurrence. Several flattened accessory suprarenal capsules are then found in the renal and solar plexuses, and on the ganglion of the latter, varying in size from a millet or hemp seed to that of a pea.

They are occasionally of great magnitude, a circumstance which calls their fœtal condition to mind, though it may result from morbid affections. On the other hand they may be small; and this may equally be the consequence of a congenital or an acquired anomaly. A reduction of size occurs in the shape of marasmus in advanced age, or at an earlier period of life; the organ shrivels up, becomes tough and coriaceous, its cortical substance assumes a dirty yellow colour, its vascular medullary substance is obliterated; or in some cases it becomes friable, of the colour of the lees of wine, or of a rusty brown, so as to resemble the spleen of old persons. The atrophy may also be the consequence of textural changes, appearing after inflammation in the shape of induration or obliteration.

The form of the suprarenal capsules is subject to various unimportant deviations; in reference to their position we have to remark, that they do not follow the congenital dislocations of the kidneys, but in these cases invariably retain their normal position.

Their textural diseases have hitherto met with little consideration. Hemorrhage not unfrequently occurs in them, on account of the vascularity of their medullary substance. The suprarenal capsule is found distended in proportion to the amount of extravasation caused by the rupture of a vein; and according to the period that has elapsed since the occurrence of the hemorrhage, we find the blood, more or less discoloured and changed in constitution, inclosed within the cortical substance, which has become pale and atrophied, and is finally converted into a fibroid layer.

We scarcely ever have an opportunity of observing inflammation of the suprarenal capsules, except in its terminal stages, suppuration and induration. Some observers have found the suprarenal capsules converted into purulent pouches in the new-born infant, and even in the fœtus (Andral).

The morbid growths not unfrequently seen, are: tubercle and cancerous degeneration; both, and particularly the latter, are found complicated with similar affections of other organs, and especially of the lymphatic glands.

Tubercle commonly appears deposited in the suprarenal capsules in large masses, and either fuses into pus inclosed in a callous sac, or is converted into a chalky concretion, invested by a fibroid tissue, in which all traces of the proper tissue of the organ have disappeared.

Cancer commonly appears in the form of medullary carcinoma, which very frequently involves the neighbouring glands of the lumbar plexus, and the kidney, and causes a considerable enlargement of the suprarenal capsule. Hemorrhage occasionally takes place within the parenchyma of the cancerous growth, and causes it to be broken down into a chocolate-coloured pulp.

It frequently happens that the suprarenal capsules become adherent to the kidneys in consequence of inflammation, or of other diseases associated with inflammatory reaction. A much rarer, though very interesting, occurrence is congenital union of the two organs, in which case one tunica albuginea invests the two, and the concave surface of the suprarenal capsule adheres to the kidney by means of short, tense, vascular, cellular tissue.

PART III.

ABNORMITIES OF THE SEXUAL ORGANS.

CHAPTER I.

ON ABNORMITIES OF THE SEXUAL ORGANS GENERALLY.

The sexual organs are occasionally entirely absent; a defect that is commonly associated with imperfect development of other parts, and especially with acephalia; a more or less important section of the apparatus is often defective, and one of the symmetrical organs, or one half of those organs which unite in the mesial line, may be absent; or again, one of these organs, or halves of organs, may be imperfectly developed, and its cavity contracted or closed up; or the apparatus may be complete in its different constituent portions and not have been duly developed, remaining permanently small and inefficient, so that the individual presents no sexual character.

Another defect of the sexual organs assumes the form of fissure, which is an arrest of various stages of embryonic development. The highest degree of this malformation is presented in the cloaca, which is to be explained as a persistence of the original sinus urogenitalis, or an imperfect separation of the parts that form the latter. A lower degree of this species of deformity is presented in the fissured condition of the sexual organs, in which case the fœtal or female character predominates; we allude to the various fissures of the uterus, of the vagina, the penis, the urethra, or the scrotum, with or without a residuary trace of the urogenital sinus.

From these latter, apparently hermaphroditic formations, which depend upon an arrest of development, those pseudo-hermaphroditic formations, which consist in an excessive development of certain portions of the female organs of generation according to the male type, form a transition to true hermaphrodisia, i. e. hermaphrodisia per *excessum;* in which case certain portions of the sexual apparatus of an opposite sex are superadded.

In addition to the just-mentioned excess of formation we meet with another form in the shape of a repetition of certain sections of the apparatus, which may either present itself as excessive development of volume or as precocity.

Besides congenital deviations of size, we find many that are acquired; in addition to those varieties which depend upon textural diseases, and particularly upon adventitious growths, they occur in the shape of hypertrophy and atrophy. The uterus in the female, the prostate in the male sex, are particularly liable to be affected by the former; the latter, independently of the process of involution (tabes senilis), which more or less uniformly involves the generative system, especially attacks the testes and the ovaries, and in a second degree the uterus.

The sexual organs are subject to numerous congenital deviations as to form; the uterus and its cavity are peculiarly liable in the female, the prostate in the male sex, to acquired malformations.

The position of the external sexual organs depends upon the congenital or acquired degree of inclination of the pelvis, and other malformations. The most important congenital deviation of position of single organs affects the testes; the uterus presents very important acquired irregularities of this class.

Diseases of the tissues are peculiarly frequent in the female organs of generation; and among them the adventitious growths are most remarkable. We shall have occasion to advert in detail to many points of interest, relative to the morbid growths occurring in the sexual organs of either sex.

CHAPTER II.

ABNORMITIES OF THE MALE ORGANS OF GENERATION.

SECTION I.—THE TESTES AND VASA DEFERENTIA.

§ 1. *Defect and Excess of Formation.*—The testes are absent when the entire sexual apparatus is absent; sometimes they are wanting when the other parts are defectively developed, or are represented by a few coils of a seminal duct; lastly, they may be in existence, but of small size, and incapable of further growth. In this case the epididymis is particularly small, its ligament elongated, and the entire organ apparently broken up. This is very commonly the case when the testes remain in the abdominal cavity or in the inguinal canal, and there is an apparent absence of testicles (cryptorchis).

The vas deferens may present a malformation, and after diminishing gradually, terminate blindly at some distance from the vesiculæ seminales, and generally in the inguinal canal.

Excess of development, in the shape of a plurality of testicles, is undoubtedly very rare; the fact itself is not supported by sufficient proofs.

§ 2. *Deviations of Size.*—Increase of size of the testicles depends upon hyperæmia, upon inflammation and its consequences, i. e. upon the inflammatory enlargement itself, and the residuary product of inflammation and induration upon hypertrophy of the cellulo-fibrous stroma, and upon morbid growths and degenerations of the organ.

Enlargements of the testicle are to be carefully distinguished from distension of the tunica vaginalis.

Besides congenital smallness of the testicle, dependent upon arrest of development, we not unfrequently meet with atrophy of the testicle. It occurs not only in the shape of marasmus senilis, accompanied by flabby texture of the organ and a dirty yellow colour of its tissue, but it is found at earlier periods of life as a consequence of exhaustion, of gonorrhœal neuralgia of the testis, and from unexplained influences in the tropics (Larrey). The testicle also becomes atrophied in consequence of pressure exerted by effusion into the vaginal sac, by large herniæ, by exudations within its substance, and by morbid growths.

§ 3. *Deviations of Position.*—We have to notice the fœtal position of the testicles within the abdominal cavity, or in the inguinal canal (cryptorchis). It is important both from being commonly associated with defective development of the testicle, and on account of the doubt arising as to the sex of the individual, as well as on account of the descent of the testicle, which commonly occurs about the period of puberty, and the consequent occurrence of (congenital) inguinal hernia.

In rare cases the descending testicle does not pursue its regular course; it either passes under the crural arch, or sinks into the pelvic cavity.

§ 4. *Diseases of the Tissues.*

1. *Inflammation.*—*a.* Inflammation of the testicle is a common occurrence; but, nevertheless, rarely a subject of cadaveric investigation. It may be either primary, secondary, or metastatic.

It may also be acute, or, as is more frequently the case, chronic; it either attacks the entire testicle, or the epididymis, or single lobules of the former chiefly. Accordingly, the tumefaction of the organ is either uniform or irregular; its tissue is at first more or less reddened, injected, and according to the coagulability of the inflammatory product, either firmer or looser than in the normal condition.

Acute inflammation not unfrequently passes into suppuration; the chronic form more frequently ends in induration and permanent enlargement of the organ. The orchitic abscess not unfrequently discharges externally by one or more openings, after inducing perforation of the tunica albuginea, and of the agglutinated lamellæ of the tunica vaginalis. The inflammatory product becomes more or less organized, and converted into a fibroid cartilaginous mass, and the resulting induration induces atrophy of the testicle.

b. Chronic inflammation affecting the tunica albuginea and its processes, in rare cases induces considerable thickening of this fibrous sheath, hypertrophy of the fibro-cellular tissue within the testicle, enlargement and morbid induration of the latter, and finally atrophy of its proper tissue.

The progress of inflammations of the testicle would appear to be sometimes impeded, and a cure brought on, by the pressure which an effusion into the tunica vaginalis exerts.

2. *Morbid growths.*—*a.* We have already found that fibroid tissue occurs as a consequence of chronic inflammation, and its termination in induration.

b. The formation of cysts is very unusual, a fact that acquires special interest from the frequency of their occurrence in the ovaries.

c. Enchondroma is equally rare.

d. An anomalous osseous substance is sometimes developed in the indurated testicle, i. e. in the fibroid tissue; and assumes the shape of round, tuberculated, or tendiniform concretions.

e. Tubercle.—Tubercle not unfrequently attacks the testicle primarily, and its chief seat is the epididymis. From this point it not only spreads to the vasa deferentia, the vesiculæ seminales, the prostate, and the glands that are connected with the organs of generation generally; but also to the lymphatics of the abdomen, the thorax, and even of the neck on the one hand, or on the other to the urinary organs, in the manner previously described (p. 208). In the former case we find the glands aggregated or strung together in large, shapeless, nodulated masses, and infiltrated with cheesy tubercular matter.

Tubercle is developed in young subjects who are predisposed to tubercular affections, in consequence of excessive or unnatural gratification of the sexual desires. The pathological anatomist has been unable to demonstrate its connexion with gonorrhœa, or, in other words, to prove the blennorrhoic character of the general morbid affection, as well as of tubercle itself; and we, therefore, consider the gonorrhœal theory of orchitic tubercle to be wanting in a most essential point.

The affection proves fatal, either by the universal atrophy induced by the diffusion of tubercle throughout the lymphatic system, or by the supervention of more or less acute tubercular deposition in the urinary organs, in the lungs, on the peritoneum, and in the spleen.

Orchitic tubercle generally appears in the shape of rounded nodules of the size of a millet or hemp seed or a pea, which coalesce into larger masses; they scarcely ever undergo a retrograde metamorphosis, but fuse, and thus establish tubercular suppuration or phthisis orchitica. The increase in size of the testicle varies according to the number of the individual tubercles, and more still according to the size of the tubercular conglomerations. Its surface is irregular and nodulated. The tissue surrounding the tubercle and the tubercular abscess becomes cartilaginous, lardaceous, and tough.

In the same manner as elsewhere, and especially in the lungs, we find inflammation of the serous investment supervening upon tubercular affections; thus the tunica vaginalis testis is liable to attacks of inflammation accompanied by tuberculizing exudation of various forms.

Tubercle of the testicle is of extreme interest as contrasted with the immunity from tubercle enjoyed by the ovary.

f. Cancer.—All the varieties of cancer undoubtedly occur in the testicle, but both according to my own observations and those of others, medullary carcinoma is the most frequent. It always gives rise to very extensive degeneration, is very soft, and presents fluctuation; sometimes it perforates the tunica vaginalis and the skin, and is thus converted into an open cancerous sore.

It generally so completely takes the place of the proper orchitic tissue that no trace of the latter is left; still many cases occur in which it occupies the interstices of the hypertrophied fibro-cellular stroma of the testicle. It is peculiarly liable to a complication with renal cancer, and also with medullary growths in the cellular tissue surrounding the pelvis and the hip-joint, with medullary retro-peritoneal growths, and finally with universal cancerous cachexia.

The frequency of its occurrence in the testicle, especially as a primary affection, is of interest when contrasted with the rarity of its appearance in the ovary, and with the frequency of cysts and the allied form of areolar cancer, in the latter.

The vas deferens is generally attacked by disease extending to it from the testicle, or the vesiculæ seminales; it is found to be affected by induration and thickening of its coats and ossification, which probably result from inflammation, by tubercle, and cancerous degeneration.

Appendix.—Abnormities of the Tunica Vaginalis Testis.

In consequence of an arrest of development, the cavity of the tunica vaginalis may remain in communication with the peritoneal cavity, and thus give rise to congenital inguinal hernia.

All the diseases affecting the tissue of serous membranes are found to occur here; inflammatory affections of every degree and variety, followed by the most various effusions, are common; and of the sequelæ, adhesion by means of various tissues of new formation, and ossification of the fibroid exudations, are not unfrequent. Among the morbid growths we notice the anomalous fibroid and osseous tissues in the form just mentioned, as well as subserous, fibro-cartilaginous, and osteoid formations, which we sometimes find as free corpuscles in the tunica vaginalis, and tubercle, occurring especially as tubercular exudation; this must be distinguished from tuberculosis of the testicle, with which, however, it is often coincident.

Dropsy of the tunica vaginalis, or hydrocele, is a common disease, occasionally brought on by varicosity and stasis in the venous network of the testicle and the spermatic cord, in which case it has the character of a passive accumulation; sometimes it is the result of slight inflammatory affections of the serous membrane.

SECT. II.—ABNORMITIES OF THE VESICULÆ SEMINALES.

§ 1. *Arrest and Excess of Development.*—The vesiculæ seminales are absent when the testicles are deficient, and are more or less abortive when the testicles are imperfectly developed.

It is stated that they have been found increased in number in cases in which there were supernumerary testicles.

§ 2. *Deviations of Size. Of caliber.*—Under this head we class, on the one hand, the dilatations of the vesiculæ seminales and ductus ejaculatorii, resulting from continued catarrhal irritation, which, according to Lallemand, accompanies spontaneous discharges of semen, and on the other, the atrophy and obliteration of the vesiculæ seminales, which may, but does not necessarily, follow removal or atrophy of the testicle.

§ 3. *Diseases of the Tissues.*

1. *Inflammation.*—We not unfrequently have opportunities of observing, in the dead subject, the effects of chronic catarrh and its sequelæ, upon the vesiculæ seminales; they are, especially, tumefaction and relaxation of their mucous membrane; secretion of a grayish or yellow purulent mucus (blennorrhœa), dilatation, and, finally, thickening of the parietes. In rare cases we find those portions of the inner surface in which the mucous membrane has been destroyed by suppuration, covered by a whitish or slate-coloured, reticular pulp, of a cellulo-fibrous texture, the parietes considerably thickened and cartilaginous, and the cavity contracted and obliterated. This inflammation as rarely degenerates into ulcerative perforation of the vesiculæ seminales, the formation of abscesses in their cellulo-fibrous nidus, into destruction of a neighbouring coil, or communication of two contiguous tubuli.

Chronic catarrh occurs chiefly in advanced age, accompanying mechanical hyperæmia of the pelvic veins, stasis, varicosity, and the formation of phlebolithes; as a consequence of chronic vesical catarrh, as a result of repeated gonorrhœal catarrh of the urethra and the neck of the bladder, of excessive venery, and especially of masturbation.

2. We find a low state of irritation developed in a similar manner in the cellulo-fibrous substratum of the vesiculæ seminales; this induces condensation and hypertrophy in the latter, and causes its adhesion to the vesiculæ seminales, which thus become fixed.

§ 4. *Morbid Growths.*

1. *Bony matter* is sometimes deposited in the indurated coats of the vesiculæ seminales, as well as in the terminal portion of the vas deferens (ossification).

2. *Tubercle.*—Tuberculosis of the mucous membrane of the vesiculæ seminales is not an unfrequent disease. When seen in the dead subject, the disease has generally attained such a

degree that the mucous membrane appears converted into a thick, yellow, cheesy, lardaceous, fissured, purulent layer of tubercular matter, filling up and closing the passage of the seminal vesicles, whilst the superficial layer of their coats is considerably thickened, and infiltrated with a lardaceous substance. The external investment occasionally becomes the seat of tubercular deposit, and, as this fuses, suppuration and perforation of the seminal vesicles are induced.

Tubercular disease is associated with tubercle of the prostate, the testicle, and the lymphatic glands that belong to the sexual apparatus, as well as with tubercle of the uropoietic system. It prevails during the prime of life, and appears never to occur before puberty; in this it differs essentially from tubercular disease of the uterus and the fallopian tubes.

3. Cancer affects the vesiculæ seminales only by extension from neighbouring organs.

§ 5. *Anomalies of the Contents of the Vesiculæ Seminales.*—The seminal fluid may present various irregularities; it is found mixed with a greater or less quantity of colourless, vitreous, grayish, yellow, puriform mucus, and with pus; if the inner surface of the vesiculæ seminales has undergone any change of texture there may be hemorrhagic exudation, tubercular pus, cancerous sanies, and, lastly, calculous concretions. The pus and sanies may, as in the ductus ejaculatorii, be introduced from neighbouring abscesses, especially of the prostate, after perforation has taken place.

SECT. III.—ABNORMITIES OF THE PROSTATE.

The prostate is generally found to be small when the organs of generation are in an imperfect condition. Its most important anomalies consist in:—

§ 1. *Abnormities of Size.*—And of these the most common is enlargement, resulting from hypertrophy. It is one of the most frequent causes of the urinary obstructions occurring in advanced life. The substance of the gland in these cases appears normal, occasionally a little softened, of a spongy elastic consistency, and succulent, i. e. its ducts contain much secretion; in other cases it appears tough and coriaceous, without visible alteration of structure. The formation of fibroid tumours (vide p. 259) is often complicated with this benignant variety of enlargement.

The enlargement varies much in degree; occasionally it is so considerable that the gland attains the size of a fist. The lateral lobes are the chief seat of the enlargement, which affects both uniformly, or predominates on one side; but the development of a so-called middle lobe (Home) is of greater importance, in reference to the impediment it offers to the discharge of the urine; it not unfrequently predominates in a most remarkable manner, even when the hypertrophy affects the entire gland. It rises from the posterior section of the prostatic ring, between the two lateral lobes, and, according to its size, projects more or less into the cavity of the bladder. It presents the appearance of a rounded tumour, of the size of a bean, or hazel-nut, which projects into the neck of the bladder; it may increase to the size of a walnut, hen's or duck's egg, or more, and then protrudes into the cavity of the bladder in the shape of a smooth or rough, nodulated, slightly lobular, rounded or cordiform, pyramidal or cylindrical tumour.

All enlargements of the prostate impose an obstacle to the passage of the urine, both by narrowing the neck of the bladder and the prostatic portion of the urethra, as well as by inducing a change in the direction of the channel, by diminishing its caliber, and by dividing it. The last two malformations are more particularly the result of unilateral development of the gland, and of increase of its middle lobe. The former not only produces a lateral contraction and deformity of the canal in the vertical direction, so as to produce a sickle-shaped fissure, but forces it out of the mesial line to the opposite side; the middle lobe not only obstructs the internal orifice of the urethra, but often narrows the neck of the bladder by pushing it on one side, or divides it into two diverging passages, which reunite in the prostatic portion of the urethra.

The results of this enlargement are hypertrophy of the bladder, dilatation of the urinary passages, &c.

A diminution of the prostate, with relaxation of the glandular tissue, is observed in rare cases, as accompanying atrophy of the testicles.

§ 2. *Diseases of Tissue.*

1. *Inflammation.*—An opportunity is scarcely ever presented of studying inflammation of the prostate in the dead subject, except in its results, suppuration and abscess, or induration. The former occurs not unfrequently as the issue of chronic inflammation, which exacerbates from time to time. The abscesses, which vary in size and number, generally discharge themselves into the bladder, into the prostatic portion of the urethra, in which case the ejaculatory ducts are destroyed, into the vesiculæ seminales, the surrounding cellular tissue, or the rectum; or they force their way along the urethra to the penis, or into the scrotum.

2. *Morbid growths.*—*a.* We have never observed the formation of cysts in the prostate.

b. Fibroid tumours occur frequently, and generally induce considerable hypertrophy of the gland. They are commonly of the size of a pea, a bean, or a hazel nut, round or oval, and when deposited in the peripheral layer of the gland, give rise to nodulated protuberances. Although they do not attain an extraordinary magnitude, they are of interest, on account of the relation they bear to analogous growths in the uterus.

c. Tubercle.—Tubercle of the prostate is always complicated with tubercle of the testis, of the vesiculæ seminales, and of the allied lymphatic glands. The softening process gives rise to tubercular abscesses, which are enlarged by the fusion of secondary tubercular deposits and thus extend beyond the gland, causing the devastations spoken of under the head of abscess.

d. Cancer.—Cancer in any shape rarely occurs in the prostate, which is curious as contrasted with the frequency of its occurrence in the uterus. Medullary carcinoma is occasionally found to attack the prostate, and to give rise to considerable enlargement of the gland; it may sometimes perforate the fundus vesicæ, and sprout into its cavity, causing a cancerous ulcer with raised edges, and of varying size.

3. *Anomalous contents of the prostatic ducts.*—The prostatic ducts, in advanced age, very often contain calculous concretions; they are generally very minute, resembling fine sand or poppy seeds, rarely attain the size of millet seeds, and still less frequently form conglomerations of the size of hemp seeds or peas. They present a black, blackish-brown, or yellowish-brown

colour, are very hard, and generally glossy. Their number varies, but is often considerable, and a section of the gland shows them more or less uniformly scattered through its tissue. The gland at the same time appears very juicy, and the ducts are more or less dilated.

SECT. IV.—ABNORMITIES OF THE PENIS.

§ 1. *Defect and Excess of Formation.*—The penis may be smaller than usual, whilst the remainder of the sexual organs are normal, or themselves imperfectly developed, or it may present some further anomalies depending upon an arrest of development; in the latter case it is reduced in length, as is the case in hypospadiasis and hermaphrodisia; the penis then bears a resemblance to the clitoris.

Fissures of the penis, or rather of the urethra, which sometimes extend to the glans, and to the penis itself, are important. They are termed hypospadiasis and epispadiasis, the former of which is by far the most common. Both present various degrees, but the first is particularly liable to variations. We here find the fissure affecting a greater or less extent of the urethra from the glans backwards, or even involving the entire penis together with the scrotum; the penis remains in a corresponding state of imperfect development as to size and form; the prepuce is also fissured and small, the glans divided; in higher degrees, the smallness of the organ, the total absence of foreskin, the retraction of the scrotal fissure, and the imperforate condition, induce a resemblance to the clitoris; and mistake as to the sex of the individual will be the more likely to occur if the scrotal fissure leads to a cul-de-sac simulating the vaginal passage. Epispadiasis is a very unusual occurrence, and is either limited to the glans or extends over the entire urethra; in the latter case it is complicated with eversion of the bladder (fissure of bladder).

Excess of development, except as more or less remarkable enlargement of the penis, is very rare; the few observations recorded of two perfect penes placed beside or above one another are not to be credited.

§ 2. *Deviations of Size.*—Atrophy of the penis, accompanied by obliteration of the tissue of the glans and the corpora cavernosa, deserves notice; it is probably always associated with atrophy of the testicles.

An apparent diminution of the penis is presented in the retracted state, induced by large scrotal herniæ, sarcocele, hydrocele, œdema of the scrotum, &c., in consequence of the relaxation and advance of the common integument.

§ 3. *Diseases of the Tissues.*—They affect the glans and the corpora cavernosa of the penis.

We meet with mechanical hyperæmia of all the spongy tissues as an accompaniment of most of the advanced stages of organic heart diseases; we find a similar tumefaction of these parts in cases of asphyxia, especially when produced by strangulation.

Inflammation of the cutaneous investment of the glans, which is generally complicated with inflammation of the internal lamina of the foreskin, gives rise to excoriation, exudation of coagulable lymph, adhesion of the prepuce to the glans, suppuration, and ulceration; when chronic, it induces exuberant formation of epidermis, and if the deeper parts of the parenchyma of the glans are involved, obliteration, cartilaginous induration, and atrophy follow. Inflammation of the coronal follicles induce increased secretion of a fluid, corroding smegma, and follicular ulceration. Ulcers of a specific character present deep, white, striated, more or less hard, cartilaginous cicatrices, which vary according to the size of the ulcerated surface, and the intensity of the surrounding reaction.

Inflammation of the corpora cavernosa, though of rare occurrence, is brought on by contusions or by gonorrhœal metastases; it occasionally terminates in obliteration of the cells, and, by means of the inflammatory product, in the conversion of the latter into a cellulo-fibrous cicatrix; the uniform turgescence of the penis in erection is thus permanently impeded.

Among the morbid growths, we have to notice the warts occurring on the glans and carcinoma, and carcinomatous ulcers on the glans and the corpora cavernosa; the former occur frequently, the latter very rarely. Cancer appears chiefly to assume the medullary form; it gives rise to considerable malformation and enlargement, and to ulcerative destruction of the penis.

We find an anomaly in the secretion occurring in the shape of abundant discharge of sebaceous matter, which, in the case of phimosis or a neglect of cleanliness, accumulates on the glans and round the corona in the shape of lamellæ and tubercular masses, and, after long stagnation and decomposition, brings on inflammation, excoriation, and ulceration, or becomes inspissated, so as to form calculous concretions (calculi glandis).

SECT. V.—ABNORMITIES OF THE CUTANEOUS COVERING OF THE PENIS AND THE SCROTUM.

§ 1. *Defect and Excess of Formation.*—As a defect of formation, we notice the occurrence of extreme shortness or contraction (phimosis) of the prepuce; fissure and entire absence of the foreskin in hypospadiasis, and the clitoroid arrest of development of the penis. The scrotum is small when the sexual apparatus is imperfectly developed, and in cryptorchis, and is sometimes only represented by a slightly corrugated cutaneous fold, which shows an almost imperceptible raphe, and occasionally contains adipose cellular tissue. In hermaphroditic formations it is fissured, and resembles the labia of the female genitals, in those cases especially in which the two halves are empty, viz. when the testicles have been retained in the abdomen or in the inguinal canals.

Excess of development occurs in the penis in the shape of exuberant formation of skin, as a very long foreskin (occasionally characteristic of a particular race), in the scrotum as considerable enlargement, and in either as extreme thickness of the common integument, with an unusually well-marked and projecting raphe, which is continued upwards on the penis; there is also an accumulation of the tissue of the tunica dartos and of the subcutaneous cellular tissue.

§ 2. *Anomalies of Size.*—Besides the congenital anomalies we have to notice the acquired enlargement of the scrotum, resulting from hypertrophy of the tunica dartos, sarcocele, or elephantiasis, accompanied by fibrous induration; in Egypt more especially it attains the most enormous dimensions.

§ 3. *Diseases of the Tissues.*—The common integument of these parts is liable to the primary and secondary diseases to which the skin generally is subject; but it is also liable to primary and secondary inflammatory processes of a specific character, to ulcerative disorganization, to induration and condensation, and even to gangrenous destruction. Paraphimosis of the prepuce resulting from inflammatory swelling, and the ulceration which causes the glans to pass through the ulcerated opening, and denudes the glans of its foreskin, deserves special mention. The scrotum is frequently attacked by metastatic processes and by gangrene; it is remarkable for the facility with which it is reproduced; it is also subject to leprous degeneration, discoloration, and to chimney-sweeper's cancer. The tunica dartos is variously affected in the above-mentioned processes; it is also found to be the seat of œdema, of sanguineous effusion (hæmatocele), of urinary infiltration, suppurative inflammation, fibrous induration, which is sometimes confined to the septum scroti, of urinary fistulæ, and of various morbid growths.

CHAPTER III.

ABNORMITIES OF THE FEMALE SEXUAL ORGANS.

THE EXTERNAL GENITALS.

SECTION I.—ABNORMITIES OF THE PUDENDA.

ARREST of development occurs in the shape of total absence of the pudenda; absence or defective development, i. e. unusual smallness of individual parts, the labia majora and minora, or the clitoris; absence of the rima or of the commissures, i. e. unusual fissures, such as we see at the superior commissure, accompanied by eversion of the bladder and separation of the symphysis pubis.

Excess of development is met with as uniform or partial congenital enlargement of the labia, nymphæ, and clitoris, causing the latter to resemble a penis; as increase in the number of individual parts, as of the nymphæ, and as precocious or extravagant development during puberty.

Congenital anomalies of form affect particularly the nymphæ; like the acquired anomalies, they present several varieties.

The diseases of tissue are primary or secondary; they consist in metastatic inflammatory processes, varying in degree and rapidity, accompanied by increased sebaceous secretion, great epidermal development, excoriation, œdema, superficial and profound suppuration, condensation and induration, gangrene of the external and internal labia; we meet with specific circumscribed inflammation and ulceration of the latter; among adventitious products, condylomatous excrescences occur in them and on the clitoris, varying in size and number, and occasionally producing extreme deformities. We also find hemorrhagic effusion occurring within the labia spontaneously, or in consequence of external violence (sanguineous tumours), and, besides steatomatous (fibroid) tumours, all the adventitious growths occurring in the cellular tissue at large.

SECT. II.—ABNORMITIES OF THE VAGINA.

§ 1. *Defect and Excess of Formation.*—The vagina may be totally absent, or partially deficient; in the latter case there is a cul-de-sac opening externally, or the vagina terminates blindly at a greater or less distance from the labia, or opens posteriorly into the urethra—in this instance the development takes place from both points, but an intervening portion is defective, thus forming a transition to congenital atresia. When the other parts of the sexual apparatus are atrophied, or certain of its sections, as, for instance, the clitoris, approach the male type, or in cases of hermaphrodisia per excessum, the vagina is not duly developed, and is found rather narrow than short, smooth, and without rugæ.

We must here allude to an apparent excess of development, called the double vagina, or division of the vagina into two channels which lie in juxtaposition to one another. It is produced by a vertical septum that descends along the mesial line of the vagina; and in a low degree is indicated by a more ridge-like elevation of the columnar rugæ. The division of the vagina may be complete, and is then associated with division of the uterus and its orifice, and with a double hymen; or it may be incomplete, and in this case the septum ceases above, and the fornix vaginæ is common to both passages, the os tincæ being at the same time single or double; or else the septum does not reach down to the vaginal entrance, which is protected by a single hymen, and the vagina is single to a greater or less extent; or, lastly, the septum is incomplete, inasmuch as it presents partial defects. The deviation of the septum from the mesial line, which occurs in rare cases, is of interest and importance; the passage on one side may then be imperfect, or have a blind termination above or below. The following case, taken from our collection, is an instance:

Sexual organs of a very imperfectly-developed female of fifteen, who was covered with scrofulous ulcers and cicatrices, and died of tubercular phthisis of the lungs and the intestines. Two very delicate, elongated, fusiform uteri, each provided with one fallopian tube and one large ovary, unite at the point of the internal orifice at an obtuse angle (uterus bicornis), and are from this point separated by a vertical septum, so that each cervix has its distinct vagina. The two vaginæ descend on both sides of a septum, which is a continuation of the septum uteri, down to the external pudenda, which are closed by a single hymen, the left vagina being considerably wider and presenting larger rugæ than the right. The latter terminates at about the middle of the entire vagina, in a blind sac formed by the septum; the left vagina immediately bulges out to the right in the shape of a single canal. The external organs are, like the uterus, in an extremely undeveloped condition. It is a curious coincidence that the right kidney was absent, the left being at the same time enlarged, and its hilus directed forwards.

The hymen is often too large, owing to excess of development, so as almost to close up the entire passage; it deviates at the same time from its normal shape and mode of attachment, inasmuch as it is generally connected with the internal labia by a small round column, by which means two orifices are formed which lead into the vagina.

§ 2. *Anomalies of Size.*—The congenital anomalies involve a greater or less dilatation, such as we find to be peculiar to some nations; and the contraction which we have spoken of above, the highest degree of which is complete closure.

Congenital atresia, which we have above classed with partial defect of the vagina, is commonly produced by an enlarged hymen, or, in exceptional cases, by an horizontal or obliquely-placed membrane, which occupies different parts of the passage; if carefully examined we should probably find that it was formed by the adherent parietes of a vagina, ending above and below in a cul-de-sac. This form of atresia would, in that case, have to be considered as partial (and slight) deficiency of the vagina.

The acquired irregularities appear, on the one hand, as unnatural elongation or dilatation; on the other, as shortening or narrowing, amounting even to complete obturation.

The vagina is liable to an uniform or partial elongation, with disappearance of the rugæ and diminution of its arch, in consequence of traction exerted by the uterus or ovaries, owing to uterine tumours or enlarged ovaries that mount into the abdomen, or to morbid growths that force those organs upwards.

Prolapsus uteri, tumours projecting into its cavity, especially fibroid tumours, polypi of the uterus, pessaries, and the like, induce dilatation of the vagina.

Shortening or narrowing is the result of injury and loss of tissue that has been intentionally or accidentally induced, of ulceration and the resulting cicatrices. The vagina is also narrowed when the passage is elongated by traction, and its cavity is diminished when the cervix uteri becomes atrophied.

Acquired atresia may be complete or incomplete, and result from adhesion of the anterior and posterior walls of the vagina to a greater or less extent, in consequence of excoriation or ulceration; or it may be produced by flat or rounded cords that pass horizontally or diagonally across the vagina and reduce its caliber. The latter may consist of vaginal folds brought on by traction, or of the membranous bands left after the cure of ulcerative loss of substance.

§ 3. *Deviations in Position and Form.*—The form of the vagina is modified in a manner corresponding to the anomalies which we have first examined, and in a medico-legal point of view we have to notice the unusual forms presented by the hymen after it has been ruptured. Instead of the carunculæ myrtiformes, a more or less considerable annular tumour remains; or if the hymen was inserted into the nymphæ, one half is left so as to form a species of valve, or it is entirely torn out in the shape of a ring.

Among the deviations of position we notice intussusception and prolapsus of the vagina, which affect mainly the anterior wall of the vagina and the eversion of the anterior or posterior vaginal parietes in vaginal hernia (cystocele vaginalis, hernia vaginalis posterior).

§ 4. *Solutions of Continuity.*—Besides the injuries inflicted by means of cutting instruments, which generally implicate various neighbouring organs, and the ruptures caused by concussion and contusion, we have to mention the contusions and ruptures of the vagina occurring during parturition, whether or not occasioned by operative interference, and the loss of substance by ulceration. The contusions or lacerations affect the vagina alone, either superficially or throughout its tissues, or they are associated with contusions and lacerations of the uterus; in the last case, the injury affects the vagina and the uterus simultaneously, or a laceration of the latter is carried down to the former to a greater or smaller extent. Neighbouring organs, and especially the bladder, may also be involved in the solution of continuity.

In difficult or hurried parturition, when the parts have not been properly supported, the vagina, the posterior commissure, and the perineum may be ruptured, and when the parturition is effected by the perineum, the vagina is perforated above the sphincter.

Ulcerative destruction is not always limited to the vagina, but frequently gives rise to communications between the cavities of the vagina, the bladder, or the rectum, or with both at the same time by means of fistulæ or large cloacæ.

§ 5. *Diseases of the Tissues.*

1. *Inflammation.*—*a.* Catarrh affects the vagina very frequently in the protracted acute, or, if blennorrhoic, in the chronic form, and presents the most various characters. It may be a simple benignant catarrh, or have the specific qualities of the scrofulous, arthritic, syphilitic, impetiginous, or gonorrhœal catarrh; it is sometimes complicated with blennorrhœa of other mucous membranes, and is either idiopathic or symptomatic, accompanying various local inflammatory, ulcerative, or degenerate processes in the vagina, the uterus, and neighbouring organs.

The vagina appears flabby, its mucous membrane tumefied and pale, invested with a pale thick coating of epithelium, or excoriated and reddened, with enlargement of the follicles, which are surrounded by a vascular ring. It contains and discharges a secretion varying in quantity and quality, and mixed up with the products of the associated inflammatory and ulcerative processes. In its pure condition it is a white, thin, milky, or creamy mucus, which is commonly secreted in considerable quantities, and indicates an abundant formation of epithelium and desquamation, or it appears as a vitreous, grumous, and viscid, or as a yellow puriform mucus.

Catarrh of the vagina is an important disease, not only on account of the extreme loss of fluids which it often entails, but also on account of the imminent danger of its extension to the uterus and the fallopian tubes, and the consequent morbid affection of these organs. It predisposes to intussusception of the vagina, owing to the relaxation it induces; it leads to excoriation and superficial ulceration, both of the vagina, the external pudenda, the parts in their vicinity, and of the cervix uteri, to closure of the os tincæ, to follicular suppuration, atresia vaginæ, permanent hypertrophy of the follicles, and dilatation of the vaginal vessels. It follows that a cure is effected with extreme difficulty, and that relapses occur very frequently.

b. Exudative processes.—In rare cases primary croup occurs on the vaginal mucous membrane alone; but it exists more frequently in complication with an exudative process on the internal surface of the uterus, in the shape of puerperal disease. As the latter generally predominates, the affection is usually found to have spread from the uterus to the vagina. Exudative processes with various products occur more frequently in patches, or throughout the vagina as secondary diseases, both as a result of puerperal affection of the uterus, as well as in consequence of an infection of the blood proceeding from other causes, or from a degeneration of the typhous and various exanthematic processes. They correspond to the condition of the blood and its products, and accordingly produce a solution of the mucous membrane and the submucous layer, varying in shape and depth, and not unfrequently resembling gangrenous destruction. A loss of substance may ensue, and to this cause undoubtedly many cicatrices found in these parts are to be attributed. They also not unfrequently extend to the pudenda, the perineum, and the nates, and give rise to extensive disorganization.

We must make special mention of the secondary form of typhus occurring in the vagina. It does not appear to exhibit itself in the vaginal mucous membrane in its genuine form, but is often found degenerated into croup and gangrene. It is remarkable that an existing blennorrhœa, especially if of a gonorrhœal or syphilitic character, exerts a powerful attraction upon it.

c. Inflammation of the submucous cellular tissue of the vagina.—It very rarely appears in the chronic form; it leads to considerable thickening and coriaceous induration of the vaginal parietes; the latter at the same time become less moveable, so as to seem agglutinated to the adjoining parts.

2. *Ulcerative processes.*—We here meet with the simple (catarrhal) follicular ulcer, the circumscribed or diffused solution of the tissues resulting from exudative processes, the syphilitic ulcer, the phagedænic ulcer of the os uteri, which generally spreads from the cervix uteri to the vagina, and the true cancerous ulcer. At the cervix we find some other ulcers, of which we shall have occasion to speak more fully at a future period.

3. *Gangrene of the vagina.*—Gangrene is the result of pressure and contusion produced during difficult parturition; it also occurs in the shape of gangrenous eschar and gangrenous or putrid fusion of the mucous and submucous layers.

4. *Morbid growths.*—Their occurrence is altogether unusual, and even the fibrous and cancerous tumours that we meet with are but rarely observed. The cysts that are found in this region are developed in the cellular tissue external to the vagina, and, anatomically speaking, bear a very subordinate relation to the latter.

Fibroid productions almost invariably coexist with similar growths in the uterus; they may be developed in the external fibro-cellular layer of the vaginal parietes, and especially at their posterior surface; they then project with a larger or smaller segment, in the shape of round tumours, into the vaginal cavity. In other instances they are developed in the cellular tissue that is interposed between the vagina and the rectum, and, though in close relation to the vagina in point of origin, project chiefly into the rectum, and more or less obstruct its inferior portion. The latter circumstances are characteristic of the relation in which these morbid growths stand to the uterus and to the accumulations of cellular tissue which occur in these regions.

Carcinoma of the vagina is, in most cases, cancer of the uterus which has spread to the vagina; however it may exist, though the latter is in a very undeveloped state, and even without it, in the shape of primary carcinoma of the vagina. It belongs to the fibrous or medullary variety, and, in proportion to its growth, induces thickening of the parietes, tuberculated condensation of the internal surface, and corresponding contraction of the passage; the vagina becomes adherent to the neighbouring parts, in consequence of cancerous degeneration of the cellular tissue surrounding it and the rectum, and finally cancerous ulceration and excrescences are established. The greater part of the vagina generally becomes involved, and the lower portion is prolapsed; the disease extends to the rectum, the bladder, the urethra; by the pressure it exerts it causes retention of the urine and dilatation of the bladder, and, when it has reached the ulcerative stage, recto- and vesico-vaginal fistulæ result.

§ 6. *Anomalies of the Contents of the Vagina.*—Under this head we class, besides the anomalies of the mucous secretion in vaginal catarrh, the products of exudative and ulcerative processes, the contents of the bladder and the rectum, when introduced by fistulous communications, the products of the diseased mucous membrane of the uterus and the fallopian tubes; blood that may be derived from various sources, and in various states of coagulation, discoloration, and decomposition. The presence of blood assumes particular importance when it is retained by a redundant hymen, or by congenital or acquired obturation; we include in this category pessaries and the adherent calculous deposits, various substances that have been introduced from without, and, lastly, the problematic cases of vaginal pregnancy.

THE INTERNAL SEXUAL ORGANS.

SECT. I.—ABNORMITIES OF THE UTERUS.

§ 1. *Defect and Excess of Formation.*—Complete absence of the uterus must be considered as extremely rare; in most cases in which the uterus was found deficient in the dead or living subject, rudiments of a uterine organ of different forms were discovered.[1]

The most common case of arrest, which is generally considered as absence of the uterus, is that in which the fold of the peritoneum, which is destined for the reception of the internal sexual organs, contains, on one or both sides, posteriorly to the bladder, one or two small, flattened, solid masses, or larger hollow bodies, with a cavity of the size of a pea or a lentil, which is lined with mucous membrane. They are to be viewed as rudiments of the uterine horns, and the fallopian tubes bear an exact relation to their development. These may either be totally deficient, or terminate in the vicinity of the uterus in the peritoneum as blind ducts, or they may communicate with the uterus with or without an open passage.

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[1] Oestr. Jahrb., xvii, 1.

This formation of the uterus, and especially the existence of two lateral, hollow, elongated and rounded uterine rudiments, each of which is connected with a corresponding fallopian tube and ovary, constitutes what Mayer terms the uterus bipartitus. From each of the uterine rudiments a flattened, round cord of uterine tissue ascends within the fold of the peritoneum, and the two from each side coalesce. The place of the uterus is occupied by cellular tissue, in which a few uterine fibres, derived from the just-mentioned cord, may be traced; it presents the general outline of a uterus, and, reaching downwards, rests upon the arch of a short vaginal cul-de-sac. The external sexual organs and the mammary glands, as well as the general sexual character of the individual, attain a normal development.

If we pursue the progress of these uterine rudiments we find a development on one or both sides; representing in the former case, a uterine half, or a uterus unicornis; in the latter, a two-horned uterus, or uterus bicornis, varying in degree; this is what is falsely called the double uterus, uterus duplex. These, and the following uterine formations which depend upon fissure, offer considerable interest.

The one-horned uterus may be always demonstrated to be a uterine half, developed from a rudimentary uterine horn, or the unsymmetrical half of a uterus bicornis, either of the right or the left side. It is a cylindrical or fusiform body, that is curved towards the corresponding side, and from the superior portion of which a tube passes to the ovary. The following are the proofs of its resulting from an arrest of development; it presents:

Firstly, A vertical diameter, which generally resembles that of a normal uterus;

Secondly, A diminution of the transverse diameter;

Thirdly, A small (virginal) fundus, with a preponderating thickness of the long and spacious cervix (fœtal state);

Fourthly, The arch in which this uterus is deflected from the meridian is variously curved;

Fifthly, The cervix, as it descends, corresponds more and more to the axis of the body, and its vaginal portion entirely coincides with it. In the virginal uterus the latter is always small, and the vagina narrow;

Sixthly, In the os tincæ the palmæ plicatæ approach closer to the convex margin of the uterus;

Seventhly, The broad ligament on the side of the deficient uterine half is in some cases remarkably large; it at least presents sufficient room for the absent symmetrical half of the uterus.

The fallopian tube of the defective side shows various relations; if there is no indication of a uterine horn it is almost always absent, and the broad ligament generally forms a slightly fringed prolongation at the point corresponding to the free end of the tube. Occasionally it is even absent when there is a rudimentary uterine horn, and it presents the relations described at p. 272. In rare cases we find a total absence of one half of the uterus, whilst the corresponding tube terminates blindly in the convex margin of the one-horned uterus above its cervix.

The ovary of the defective side is, with rare exceptions, present even when the fallopian tube is wanting.

We are the more induced to extract the following remarkable case from the essay cited elsewhere (Vol. III,) as an instance of the transition from the uterus bipartitus to the uterus bicornis, as the case of pregnancy in a uterine rudiment (one half of the uterus bipartitus), which we shall have occasion to quote at a future period, will thus be rendered more intelligible.

The internal sexual organs of a tailor's wife, æt. 34, who died in the lunatic asylum on the 24th of September, 1830, had always menstruated scantily, and borne no children, present the following relations. The uterus has a conical shape, is two inches and three lines in length, presents a curve to the left, has tolerably thick parietes, and is acuminated above; the fimbriated extremity of the fallopian tube is agglutinated to its ovary. On the right side there is a very large ligamentum latum, within which, at a distance of two inches from the uterus just described, and on a level with its superior portion, there is a body of the size of a hazel nut, consisting of uterine tissue, and presenting a cavity of the size of a lentil, into which a tube an inch and a half long, and of a sigmoid serpentine form, opens. Posteriorly this uterine rudiment sends off a carneous prolongation, representing the ovarian ligament, anteriorly it gives off a round ligament. On its inner side it is prolonged in the direction of its axis, i. e. obliquely downwards, as a solid band of uterine substance, which impinges upon the convex right margin of the left uterus one inch above its external orifice. Both ovaries are small and contracted, the cervix is small, the vagina narrow, and its arch infundibuliform.

If the two rudiments of the uterus bipartitus are developed uniformly, according to the type of the one-horned uterus, two uterine halves are formed, which unite at one point of their convexity, and thus give rise to the uterus bicornis. The degree of this abnormity varies, and depends chiefly upon the point at which the two halves coalesce. The nearer the latter approaches to the external orifice, the more obtuse will be the angle at which the junction takes place, and consequently the more extensive the fissure. The higher the point of union, the more acute will be the angle, and it may thus become so small that the two halves lie almost parallel to one another, and there is only a slight divergence of the two horns. In the latter case the uterus closely resembles the normal condition; there is always a shallow excavation of the fundus between the projecting horns; the uterine cavity is either simple or divided by a septum of varying length.

The part that unites the two uterine halves always represents the fundus uteri; the higher it is placed, the more this character becomes evident; and when it attains the same level as the uterine horns and surmounts them with its arch, the form of the two-horned uterus disappears. We consequently find, firstly, that the commissure in all cases occupies an horizontal position in the angle in which the two uterine halves meet.

Secondly. That the commissure is always developed in conformity with the fundamental type, viz. that it is a portion of uterine tissue presenting an arch posteriorly, or rather being obtuse-angled and thicker behind.

Thirdly. That when a septum exists it always proceeds from the commissure.

Fourthly. That, however low the commissure be placed, it exerts an evident influence upon the mutual position of the two uterine halves and the internal conformation of their cervices. This consists, in the first instance, in the slight convexity of the posterior, and the slight concavity of the anterior, surface of the uterus bicornis; and in the peculiar relation of the two uterine halves to one another, which is marked by a slight convergence and inclination anteriorly, thus affording the character of a normal uterus. The influence too that is exerted upon the palmæ plicatæ in the uterine halves is singular; the anterior one is placed internally next to the septum, the posterior one lies more externally, and on account of the greater thickness of the fundus uteri—corresponding to the normal character—more towards the posterior surface. The fact of the fundus being wedged in between the cervices in its original form, causes the palma plicata posterior to diverge still more; it induces a slight rotation of the uterine halves anteriorly, which is followed by the above-described form and position of the uterus bicornis.

The septum, which descends from the fundus uteri, may reach down to the os tincæ and divide it, or it does not reach so far, and then the orifice or the cervix is common to both halves, or, lastly, it may be nearly or totally absent, and we then find the cavity of the cervix and the uterus more or less uniform, in proportion as the fundus itself is more or less elevated. If the latter is much depressed and presents no septum, a single cervical channel conducts into two uterine halves that diverge considerably, sometimes so far as to assume an horizontal position.

In rare cases, the two uterine halves do not coalesce, owing to coexisting malformations, such as fissures of the abdominal and pelvic parietes, of internal organs, especially the bladder and the intestine; the uterus thus remains completely divided, and the two halves are separated by the rectum, the colon, the small intestine, or by a rudimentary portion of either, by the mesentery or the bladder. In the majority of cases, the inferior section of both, or at least of one uterine half, is but very imperfectly developed, and this applies still more to the vagina and to the pudenda.

The lowest degree of uterine fissure is represented by the bilocular uterus. Here the projection of the uterine horns has entirely disappeared; the fundus uteri occupies a position level with the orifices of the fallopian tubes, and its convexity projects above them. The uterine cavity is divided into two vertical partitions by a central septum; the uterine horns present a normal divergence and the normal length. Yet even here the division of the uterine cavity is perceptible externally; the body of the uterus presenting greater breadth, and generally a shallow fundus, in consequence of which the uterus appears lower, and its dimensions do not, in most cases, exceed those of the normal uterus; the division is also indicated by a shallow furrow running down the posterior surface of the organ.

The division of the uterine cavity by a vertical septum into two loculi extends in rare cases into the external orifice, but more generally is united to the cavity of the uterus, or the septum does not even suffice to divide the uterine cavity; when this malformation approaches the normal character of the organ, we merely observe a ridge on the fundus and along the posterior wall of the uterus, representing a rudimentary septum. If the septum does not reach the external orifice, its lower free border is always thinner, pointed, and falciform. It probably always descends lower at the posterior than at the anterior surface of the uterus, and this becomes particularly apparent when it merely exists in a rudimentary state.

In the case of the uterus bicornis or bilocularis, the vagina is either single, or may in either be divided in all the forms and degrees described at p. 265. The most perfect fissure seen is that in which the septum of an uterus bicornis or bilocularis descends to the external orifice, divides the latter, and extends to the vagina; the septum may reach as far as the pudenda, and in the virginal state divide the hymen. In this case there is a separate vagina for each half of the uterus.

All these malformations of the uterus occur associated with various irregularities in other organs, as also in individuals that in other respects are well developed. In reference to conception, pregnancy, and parturition, connected with the uterus bicornis, bilocularis, and unicornis, we have to make the following remarks.

Firstly. Numerous well-authenticated observations prove that the anomalous conditions of the uterus which we have discussed, i. e. the uterus bicornis and bilocularis, with or without division of the vagina, and even the uterus unicornis, are capable of being impregnated. In the first we find repeated pregnancy occurring in either half, but there is a preponderance in favour of the right side. There are even cases on record of a twin pregnancy occurring in one, or of concurrent pregnancy in both halves; one fœtus has been found less developed and smaller, and in solitary cases perhaps—though this is to be received with certain doubts—superfœtation had taken place. In the Viennese Museum we have even an example of pregnancy in a rudimentary uterine horn, which terminated fatally in the third month by rupture and sanguineous effusion into the peritoneal cavity. The case was formerly taken for impregnation of the fallopian tube, until a further examination convinced me to the contrary. It is highly instructive, and doubtless the only case of the kind on record. We shall, therefore, devote a little further attention to it.

The true uterus is a uterus unicornis of the left side with a cervix, in which cicatrices that have been left by former births are visible; the left fallopian tube issues from its apex, which is turned to the left side. A tolerably thick, roundish, flattened, and hollow cord, consisting of uterine parenchyma, is inserted into the convex right margin of this uterus, and communicates by a millet-sized opening just above the internal os uteri with the cavity of the latter. This cord is above two inches in length, and is dilated externally into a sac of the size of a duck's egg, from the termination of which the right tube with its ovary, and from the lower surface a round ligament proceed. This sac, the rudimental right half of the uterus, contained a female fœtus of the third month inclosed in the normal membranes; it presented a transverse fissure, in the vicinity of the insertion of the umbilical cord, of almost two inches in length. All the membranes were ruptured. The left half of the uterus is twice as large as it would be in an unimpregnated state, its walls thick, and its inner surface, as well as that of the channel of its parenchymatous process, invested by a deciduous membrane, and the cervix blocked up with a plug of coagulable lymph.

The preparation was taken from a maid-servant twenty-four years of age, who had died suddenly after attacks of pain and spasm in the abdomen on the 24th of March, 1824, and was examined by order of the sanitary board. The body was delicately built and rather emaciated; four pounds of blood, which had been effused in consequence of the rupture of the pregnant rudimentary uterus and the fœtal membranes, were found in the lower part of the abdomen.

The formation of which we are speaking, is the same as the transition form from the uterus bipartitus to the uterus bicornis described at p. 273, with the exception that in this case the parenchymatous cord that passes from the rudimentary to the developed half of the uterus is hollow, and contains a channel which establishes a communication between the two, whereas in the other case the cord is solid. By means of this channel impregnation of the rudimentary uterus was rendered possible; this pregnancy forms a species of transition from uterine to extra-uterine pregnancy, and particularly to pregnancy in the fallopian tube.

Secondly. In reference to the course of pregnancy and of parturition in uterine formations that are capable of being impregnated, Meckel concludes, from a review of the cases that had been published in his time, that of the comparatively small number of cases of fissured uterus the majority died during or after birth; this ratio is increased by the consideration that in the great majority of these cases the malformations occurred in monstrosities, children, and virgins. Since Meckel, Carus has directed particular attention to the unfortunate issue of these cases. Numerous cases may now be opposed to the ancient and modern observations of the above description, but it appears that the unfavorable ratio pointed out by Meckel still holds good with regard to the uterus bicornis and bilocularis.

Various circumstances conspire to induce great distress or rupture of the womb, even during the early periods of pregnancy (Canestrini, Dionis), to give rise to abortion, flooding, difficult and slow parturition, with consequent exhaustion and predisposition in the uterus to puerperal disease. They become apparent on examining the fissured organ, and we find them to be the following:

a. The absence of the necessary dimensions in the uterine half that undertakes the functions of the entire organ during pregnancy, and the development of which is only provided for by one set of vessels. This applies with additional force to a rudimentary uterine half, as in the case just detailed; in reference to its termination in rupture also, it is allied to extra-uterine pregnancy, and especially to pregnancy in the fallopian tubes.

b. The obstacle opposed to the uniform development of the impregnated uterine half by the unimpregnated half. It appears that the latter, after the formation of a more or less complete decidua, keeps pace in its development with the impregnated half up to a certain point only, and then remaining stationary, forms an impediment to the uniform growth of that half. This observation is particularly applicable to the bilocular womb, with a complete septum, as the latter being common to both cavities, remains undeveloped on the side of the unimpregnated portion; it applies less to the true uterus bicornis, the two sides of which are independent of one another.

c. The nearer the uterine malformation approaches the uterus bicornis, the more the two halves of the organ diverge from the axis of the body and the pelvis. In the bilocular uterus, the uterine halves are tolerably parallel to the axis of the body; in the uterus bicornis they form an acute, or even almost a right, angle with the latter. The impregnated half of the uterus certainly shows this deviation; but in the uterus bicornis it appears to diminish, whereas in the uterus bilocularis it seems to increase. The axis of the impregnated uterine half is therefore certain to meet with the vaginal axis in an obtuse angle; consequently, during the act of parturition, the direction of the uterine force and of the expulsion of the fœtus will cross the axis of the pelvis, and fall upon the pelvic parietes that lie opposite to the vertex of the pregnant half of the womb. The direction of the impregnated half and of its force, will also be influenced by the unimpregnated half, which during the act of parturition rests upon the pelvis, and especially on the linea innominata of the corresponding side.

d. The fundus uteri and its expulsive power is of particular importance in the act of parturition. The uterus bilocularis has only one half of this part of the organ, and in the uterus bicornis it is totally deficient.

e. Carus considers the impediment to the discharge of the superfluous amount of blood from the uterus to be the cause of the fatal issue which commonly follows birth in the case of fissured uterus. In the normal uterus the return of the blood accumulated in the pregnant womb is effected by means of two sets of vessels; whereas in the fissured uterus, each half of which is supplied by separate vessels, one half of the venous channels only can carry off the blood. Consequently, although the single uterine horn becomes almost as much developed as the undivided uterus, an unfavorable relation is established, from one set of vessels only being charged with the entire quantity of blood that has to be returned. Besides the above arrests of development, we find, not so much in new-born infants as in the later periods of life, an imperfect development of the uterus occurring in reference to its size, its tissue, and especially to its vascular system; the organ remains small, and retains the fœtal or infantine character.

Excess of development, except in the shape of precocity, does not occur; the cases on record of plurality of the uterus are to be viewed as cases of fissure.

§ 2. *Anomalies of Size.*—These consist in irregular enlargement or diminution.

The former either occurs as precocious development, depending upon a congenital vice or accompanying early puberty, or it is the result of morbid increase of size, depending chiefly upon hypertrophy or dilatation.

Hypertrophy either affects the entire uterus uniformly, so that its normal form and the relations of the different parts in point of size and capacity are preserved, or it affects one segment alone, and this partial hypertrophy is particularly remarkable in the cervix.

The hypertrophy varies in degree; it not unfrequently reaches such an extent, that the uterus attains the size of a goose's egg, or of an ordinary fist, and that its parietes present a thickness of from six to nine lines.

In hypertrophy of the cervix, the coexistent malformation is remarkable. The two labia of the os tincæ often enlarge uniformly, so as to form an annular tumour; they more frequently represent two cylindrical swellings, separated by lateral fissures or oblong tumours that are turned up outside; still more frequently we find the anterior lip to be the seat of hypertrophy, and it is often elongated so as to form a simple, cylindrical, or conical teat-like body, or if the cicatrices resulting from previous lacerations prevent the uniform enlargement, it assumes the appearance of an indented or lobulated appendix, and various other strange shapes.

Hypertrophy is caused by previous and repeated pregnancy, by idiopathic or consensual irritation of the uterus, the latter involving the frequent coincidence of hypertrophy of the uterus with diseases of the mammary glands, by prolapsus, and by tedious vaginal, and especially uterine, catarrh. Morbid growths and, above all, fibrous tumours developed in the vicinity of the uterine mucous membrane, and projecting into the cavity of the uterus, are another common cause of hypertrophy; on account of the numerous peculiarities presented in these cases, we have hitherto excluded them from our investigation, and shall leave them to be discussed at a future period.

Among the cases of dilatation of the uterine cavity, we have first to notice the one in which it is complicated with hypertrophy caused by fibrous polypi, and which resembles pregnancy, and then those important cases in which the dilatation is the result of an accumulation and retention of the mucous secretion in blennorrhœa, and of tubercular pus in tuberculosis of the uterus. According to the seat of a stricture or of atresia at the internal, or at this and the external, orifice of the womb, we find the uterus converted into a simple globular, or into an hourglass-shaped body; dilatation of the proper cavity of the uterus sometimes attains such a degree as to be capable of containing a hen's or even a goose's egg. We shall speak of this under the head of acquired anomalies of the shape, as well as under that of textural changes of the uterus.

Unusual smallness of the uterus occurs in the shape of arrested development, and is the more conspicuous if affecting individuals at or after the age of puberty. The entire uterus, but especially its neck and vaginal portion, is small, dense and hard in structure, and anæmic, its mucous membrane smooth and attenuated, the follicles and folds undeveloped, and the remainder of the sexual apparatus, and particularly the ovaries, in a corresponding state of imperfect development. The affection may also consist in an acquired diminution, reduction, or atrophy of the uterus.

Atrophy generally affects the entire uterus uniformly, though it sometimes predominates in the cervix.

Atrophy of the entire organ is presented in its most remarkable form as marasmus or senile atrophy; sometimes occurring very soon after the climacteric change, and especially in consequence of tedious catarrhs which have ceased with the cessation of the menstrual discharge; sometimes occurring even before this period from debility or exhaustion of the uterus, consequent upon a rapid succession of births, or upon blennorrhœa. This condition is generally combined with contraction of the uterine cavity (concentric atrophy), or with partial contractions, atresiæ of the cervix, thinning (atrophy) of the uterine mucous membrane, and accompanied either by increase of density and coriaceous toughness of the uterine tissues, or by another change of peculiar importance, great friability and softness.

A thinning of the uterine walls is also observed to occur in various degrees, as excentric atrophy in the above-named dilatations of the uterus.

Atrophy of the cervix is of great importance on account of its occurrence in young subjects at the age of puberty, and from its probable evil influence upon conception. It has not been as yet clearly demonstrated how this affection is caused. The cervix becomes smaller in consequence of the condensation of its tissues, and at the same time the arch of the vagina is considerably diminished.

Atrophy of the entire cervix is often induced by the tension and traction resulting from the consecutive malpositions of the uterus, which accompany enlargements of the ovaries and large fibrous tumours of the uterus; in the latter case it is not unfrequently associated with hypertrophy of the body of the uterus. It is recognised in the living subject by the elongation of the vagina, and the concurrent disappearance of the cervix, and the conical shape of the vaginal fornix. In rare cases, which we shall have occasion to investigate more closely at a future period, the affection attains such a degree as to induce solutions of continuity in the cervix.

Diminution of the uterine cavity presents the various degrees of stricture, atresia, and obliteration.

Strictures and atresiæ occur generally at one or both orifices of the cervix, but rarely at other points; from here they occasionally extend so as to give rise to a partial or entire obliteration of the uterine cavity. The causes of their origin, both in reference to the physiological and pathological conditions of the organ, have not as yet been fully explained. Our own observations lead us to adopt the view that, in old persons, it is caused by an excessive concentric diminution from marasmus (a tendency in the retrograde organ to complete obliteration); in younger individuals, by chronic, and especially by gonorrhœal, catarrh of the uterus.

Contraction of the internal orifice is caused by concentric atrophy, by curvature of the uterus, or sometimes by a fine duplicature of the mucous membrane. Atresia of the passage is either induced by delicate tendinous deposits of epithelium, or by agglutination of the mucous surfaces; the external orifice becomes contracted by inflammatory swelling, hypertrophy, and cancerous degeneration of the cervix; it is closed up by the formation of a whitish layer of epithelium, or by agglutination of the mucous membrane; or, in rare instances, by parenchymatous adhesion subsequent upon injury, inflammation, and ulcerative loss of substance. The two orifices and the entire cervix may also be blocked or closed up by hypertrophied follicles, mucous polypi, cancerous growths, &c.

§ 3. *Anomalies of Form.*—Besides those malformations of the uterus which we have alluded to as resulting from arrest of development, we have here to mention congenital obliquity of the uterus. Although many doubt its existence, occasional opportunities occur of observing it in a greater or less degree of development. It presents several varieties; the simplest and original form is that in which two lateral halves of the organ are so changed in position that the upper margin does not occupy the horizontal position, and that consequently one horn and its fallopian tube is placed higher than the other, and the cervix presents a corresponding degree of obliquity. The upper border slants to either side, and its axis forms an angle with the mesial line; a vertical line would divide it in such a manner that the greater part would belong to the elevated side. The inferior half of the uterus is generally bent, or forms an angle at the internal orifice, the higher portion being at the same time much thicker and more massive. The obliquity may confine itself to the body of the uterus, and the latter then forms an angle with the cervix, which either remains perpendicular, or, in rare cases, is even deflected in the opposite direction. A slight degree of this anomaly is presented in a preponderating development of either horn. In many of the last-named cases the uterus assumes the appearance of a retort.

Obliquity is probably of importance in reference to conception, pregnancy, and parturition. It must be distinguished from the mere slanting position of the uterus.

Among the acquired malformations we first notice the oblique position induced by traction exerted upon one side by fibroid tumours, or by an enlarged ovary which has risen into the abdomen. Then those malformations are to be mentioned which the uterus presents in consequence of traction exerted uniformly on both sides, of fibrous tumours developed within its parietes, and those presented by the vagina in hypertrophy, from cicatrization after rupture or ulcerative loss of tissue; lastly, there are the malformations accompanying dilatation of the uterine cavity, and the development of an uni- or bilocular capsule. If the cavity of the uterus alone is the seat of an accumulation of mucus, owing to stricture or obstruction of the internal orifice, the former dilates into a globe, which appears seated upon the cervix as upon a stalk; if a similar accumulation takes place in the channel of the cervix from stricture or atresia of the external orifice, the cervix is converted into an ellipsoid capsule, and we then have two cavities, one above the other, separated by an isthmus, and resembling an hourglass. Mayer has termed this malformation of the uterus the uterus bicameratus vetularum.

§ 4. *Deviations of Position.*—As a congenital anomaly of this variety, we have to mention the oblique position of the womb, brought on by shortness of one of the broad ligaments, which it also retains in the impregnated state. Among the acquired deviations of position, we have first to mention anteversion, retroversion, and the less frequent and less important lateral deviations of the uterus. Retroversion is the most frequent, and this may even affect the pregnant uterus.

A condition to which hitherto little attention has been paid, consisting in an angular deflection of the fundus from the cervix uteri, must be carefully distinguished from the two former irregularities. This deflection almost always takes place forwards (Walshe's anteflexion), and very rarely backwards (retroflexion); the latter never considerable, whereas the former not unfrequently attains such an extent that an angle of 90° and less results. The fundus uteri, in this case, occupies an horizontal position, or may even direct its posterior surface forwards; and occupies the cul-de-sac placed between the uterus and the bladder. This deformity would appear to be an excessive increase of the shallow anterior curvature developed at the period of puberty, and a separation and division of the uterine cavity from the channel of the cervix, consequent upon the preponderating development of the body of the uterus. It is of importance, as it induces similar symptoms as anteversion and retroversion, and also as it probably interferes with conception in the same manner as the congenital obliquities that are complicated with similar lateral deflections, viz. from contraction of the internal orifice.

We have here also to mention prolapsus of the womb, which, as Froriep has satisfactorily demonstrated, may occur spontaneously in consequence of traction exerted upon the womb by the vagina, in the shape of hernia vaginalis posterior. The uterus appears extended; in consequence of the dilatation of the venous plexuses, and the impediment offered to the circulation by pressure, it becomes the seat of hyperæmia; there is increase of size and substance (hypertrophy); and the cervix, at the same time, from being exposed to atmospheric and other influences, is attacked by active congestion, increased secretion, exuberance of epithelium, inflammation, &c. Spontaneous prolapsus occurs in the unimpregnated uterus, and presents various degrees; so-called accidental prolapsus is developed rapidly, it may be brought on immediately or soon after parturition by direct exciting causes, and be complicated with partial, or in rare cases with complete, eversion of the uterus.

Lastly, we find the position of the uterus variously affected by enlargement or dilatation of neighbouring organs, by pelvic tumours, malformations of the pelvis, &c.

§ 5. *Deviations of Consistency.*—We shall subsequently advert to numerous deviations in the consistency of the uterine parenchyma, and especially to a diminution of consistency, resulting from various morbid processes; but an increase or diminution in the consistency occurs even without apparent disease of the tissue.

Diminished consistency is not only presented as a relaxation of the uterus accompanied by marasmus, consequent upon the exhaustion induced by parturition, or arising from paralysis of the uterine fibre in puerperal diseases, but it also occurs in a distinct form as pulpiness (marciditas), slight friability or fragility. It very frequently affects the decrepid uterus, involves chiefly the fundus, and appears generally to result from exhausting uterine discharges. The tissue of the affected uterus is of a pale or yellowish red, or sometimes ashy colour, it is torn by the slightest effort, its vessels are thickened, rigid, and sometimes ossified. This condition predisposes more particularly to apoplexy of the uterus in the advanced periods of life, and to the consequent conversion of the uterus into a sanguinolent, dark red, and subsequently, rusty, lee-coloured pulp.

This condition is of much greater importance when following parturition and puerperal morbid processes that have been complicated with phlebitis; we shall have occasion to speak more fully of this *tabes uteri post puerperium* in the sequel.

The uterus presents increased consistency as a consequence of lasting hyperæmia, of hypertrophy, or even of atrophy; the entire organ, or certain portions only, as e. g. the cervix being affected. There are various degrees, from coriaceous condensation and toughness to fibroid or cartilaginous induration.

§ 6. *Solutions of Continuity.*—Under this head we include the solitary cases observed by old writers, of rupture of the pregnant womb about the middle of pregnancy, caused by a deficiency in the substance of the uterus bicornis; the more frequent rupture of the uterus at its superior portion, in consequence of excessive labour-pains, caused by insuperable obstacles to birth on the part of the mother or the child, and accompanied by hemorrhage and escape of the contents into the cavity of the abdomen; and the still more common rupture of the uterus at its lower segment during parturition, in consequence of various difficulties.

The latter generally extends from the cervix to the vagina; it may also affect the parietes of neighbouring hollow viscera, especially of the bladder; the blood may be effused into the pelvic adipose and cellular tissue, in the vicinity of the bladder and the rectum, and between the broad ligaments; it may pass downwards into the labia, or upwards under the peritoneum into the iliac and lumbar region; or the effusion may be accompanied by rupture of the peritoneum or the bladder, and take place into their cavities. These ruptures affect the entire thickness of the uterine or vaginal parietes, or are limited to an internal layer, or they are lacerations of the vaginal portion of the uterus. They generally have a vertical direction, transverse lacerations being very rare.

In cases of difficult labour the uterus may be subjected to contusions of more or less intensity, which sometimes involve the entire thickness of the organ. The parts adjoining the promontory, or the symphysis pubis, and the horizontal rami of the pubes are most liable to suffer. The contusions may affect a circular spot and have a various extent, or they may be chiefly in a transverse direction.

In rare cases the uterus suffers a severe contusion immediately above the vaginal segment, and throughout its circumference, amounting even to laceration; thus the vaginal segment of the uterus may at once, or by a subsequent process of suppuration, become detached, and in the case of eversion of the uterus after parturition, the separation of the entire uterus from the vagina has been observed (Cook).

Finally, we have to allude to ulcerative affections of the uterus caused by or resulting from malignant puerperal disease, and in various other ways.

§ 7. *Diseases of Tissue.*

1. *Hyperæmia — Apoplexy of the Uterus—Anæmia.*—Hyperæmia of the uterus, and especially of its mucous membrane, with effusion of blood in various states of coagulation and discoloration, is often observed in the dead subject as menstrual congestion and hemorrhage. It also occurs in combination with tumefaction (congestive intumescence) of the uterus and its appendages, with relaxation of its parenchyma and the mucous membrane, dark colour, copious sanguineous contents,

and hemorrhage into the uterine cavity, representing active or passive congestion or mechanical stasis, consequent upon excessive or anomalous menstrual discharge, or other injurious influences.

Advanced degrees of hyperæmia give rise to uterine apoplexy, i. e. to effusion of blood into the uterine parenchyma, with or without concurrent hemorrhage into the cavity of the organ. It is observed in two distinct forms.

One occurs at the period of decrepitude, and is chiefly caused by the marcidity of the uterine tissue above alluded to, and by the rigidity of its vessels; its main seat is the fundus uteri, to which it may be entirely limited, or at which, if more extensively diffused, it has taken its origin, and is most prominently developed. The fragile and softened uterine tissue presents a dark red or black discoloration, extending to a greater or less distance from within outwards; the accumulation of blood may be so considerable as to destroy all traces of structure; it oozes from the cut or broken surfaces, in greater or smaller quantities, according as it is more or less coagulated. The mucous membrane presents a similar condition, and the uterine cavity very often contains more or less slightly coagulated or fluid blood. The posterior wall of the uterus is but rarely affected, and if so, but to a slight extent.

This form of apoplexy undoubtedly constitutes many of the metrorrhagic cases that occur in advanced age; the lower degrees may be cured, the tissues subsequently presenting a loose, retiform, contused, and porous appearance, of a rusty or yellowish colour.

The second form results from tedious and slow labours; it occupies the lower segment and the cervix of the uterus. The affected portion appears dark red, and full of blood; the part is dilated, relaxed, pendulous, and paralysed, and there may be contusion and laceration also.

Anæmia accompanies an arrest of development, marasmus, induration of the uterus, and general anæmia.

2. *Inflammation.*—Although we shall, as much as possible, distinguish between the mucous membrane and the uterus itself in examining this subject, we must confess that, as may be expected from the close anatomical connexion of the two, the diseases which we shall have to consider, very readily pass from

the one to the other. Yet we must also affirm that generally the lining membrane of the uterus is affected primarily, and that this is scarcely ever the case with the uterine tissue, as far as can be demonstrated by the pathological anatomist, with the exception of the reaction following traumatic influences, especially of the vaginal portion. We shall not at this place devote any attention to peritoneal inflammation, but discuss the inflammatory affections of the unimpregnated uterus, and the participation of the uterine parenchyma in them. The uterine inflammations occurring after childbirth, with their sequelæ, we shall consider in a separate appendix on puerperal diseases of the uterus.

a. Catarrhal inflammation (*endometritis catarrhalis*).—This is an acute affection; it occurs in combination with inflammation of the adjacent uterine tissues, extending to a greater or less depth and of various intensity, and even complicated with peritonitis; it is frequently met with in the sick-room, but rarely in the dead-house: it is here only occasionally observed in a protracted blennorrhoic stage.

The uterine mucous membrane is much more commonly discovered in a state of chronic catarrh and inveterate blennorrhœa, which is either the residue of acute catarrh, or the result of a similar affection of the vagina; it may occur as a sequela of parturition, or as a complication of those morbid growths that bear a near relation to the uterine mucous membrane. The mucous membrane offers a pallid appearance, or there is evidence of previous stasis and inflammation, and it then presents, with the adjoining uterine tissue, a brownish-red or slaty colour; the membrane is tumefied, relaxed, plicated, and secretes a grayish-white viscid mucus, which during temporary exacerbations, or an enduring state of more intense inflammation, appears streaked with blood, creamy, yellow, and puriform.

Here, too, we find hypertrophy of the mucous membrane resulting from chronic catarrh, in the shape of mucous or cellular polypi. They consist of club-headed elongations of the mucous membrane, in which we find a group of closed follicles, or a loculated tissue containing a gelatinous mucus, which is discharged from time to time in consequence of a dehiscence of the follicles. These excrescences occur chiefly at the fundus uteri, in the neighbourhood of the insertions of the fallopian tubes, and in the channel of the cervix—a point at which, in the normal condition, large follicles (ovula Nabothi) are found, which occasionally undergo considerable enlargement.

We find that the uterine parenchyma becomes more or less hypertrophied during catarrh, in the same manner as other muscular layers which are subjacent to mucous membranes.

Inveterate uterine catarrhs not unfrequently give rise to the above-mentioned strictures and atresiæ; and if the blennorrhœa persists, the dilatations of the uterine and cervical cavities previously discussed, result. During the progress of dilatation occurring under these circumstances, the same changes that we have already repeatedly met with under similar circumstances, in dropsy of mucous cavities and canals, are sometimes found to occur in the uterus. As the dilatation from the accumulated secretion increases, the uterine mucous membrane is converted into a thin serous membrane, which secretes a colourless, serous, albuminous fluid, resembling synovia. The uterus appears in the shape of a round, slightly-thickened, hydropic capsule, of the size of a hen's or duck's egg, or a fist. This condition is the only one that really deserves the name of hydrometra, of which several remarkable instances are related, especially by older writers. The contained fluid may always, or for a long time, remain such as above described; but it generally undergoes some alterations from the admixture of various products of slight inflammatory attacks, and especially of hemorrhagic exudations of the uterine lining, which give it a chocolate-coloured, rusty, or black tinge.

Occasionally temporary discharges of these fluids occur by the vagina during life, after which fresh accumulations take place. They are to be distinguished from similar discharges from the hydropic fallopian tube.

Uterine catarrh generally suffices to produce sterility; but it often extends to the fallopian tubes, and there also gives rise to changes that are of extreme importance in this respect.

b. Exudative processes (*endometritis exudativa*).—Croupy or plastic fibrinous exudation, whether or not accompanied by a similar process in the vaginal or fallopian mucous membrane, very rarely occurs on the inner surface of the uterus, except after confinement. It is, at all times, rather a secondary than a primary process. Exudative affections of the uterus and their varieties, occurring after parturition in the shape of puerperal diseases, are all the more frequent and the more numerous.

3. *Ulcerative processes.*—In treating of catarrh of the vagina, we have alluded to excoriation, superficial and follicular ulceration of the vaginal portion of the uterus. The specific character of the catarrh and the follicular ulceration, as well as neglect of proper attention and treatment, cause the resulting ulcers to present a more or less remarkable appearance in reference to the shape of their edges, the reaction set up, the product and the change of texture, as well as in regard to the consequent fusion of the diseased tissue, and to the concurrent tendency of disorganization beyond the ulcer. It is stated that, in reference to the first of these considerations, we may distinguish the simple (catarrhal), the herpetic, scabious, and scrofulous ulcer of the cervix; as regards the local process, there may be a fungous, lardaceous, or callous ulcer, &c. We also find primary and secondary syphilitic ulcers, cancerous ulcers that have resulted from the fusion of cancerous morbid growths, the so-called phagedenic ulcer of the os tincæ (Clarke's corroding ulcer). The latter may be compared to the phagedenic (cancerous) sore of the skin; without having a morbid growth for its base, it gradually destroys the cervix, and even the greater part of the uterus, and may extend to the rectum and the bladder. It is an irregular sinuous, jagged ulcer, the tissues at the margin and the base of which are thickened or hypertrophied, in consequence of a sluggish inflammatory process; the base presents a greenish and brownish-green discoloration, with a slight glutinous and purulent, or a more copious watery, secretion: there are no granulations, but we find a gelatinous exudation, and according to the state of the immediate reaction, the tissues are converted into the above-mentioned products of the ulcerating surface.

Lastly, we find the uterus liable at different parts, and in a varying extent, to acute or chronic ulcerative disorganization, as a consequence of puerperal affections; this subject will be examined in the appendix.

4. *Morbid growths.* *a. Cysts.*—Cysts are very rarely formed in the uterus; we have not met with a single example in Vienna, and I myself have only inspected one case of uterine acephalocysts. It is necessary to distinguish the very much hypertrophied follicles that may occur in the uterine cervix, from newly-formed cysts.

b. Fibroid tumours.—Anomalous fibrous tissue is the most frequent of all new formations occurring in the uterus, in the shape of fibroid or fibrous tumours (tumor fibrosus, desmoides, formerly called sarcoma; when ossified, osteosteatoma of the uterus; scirrhus; W. Hunter's carneous tubercles, &c.) These fibroid growths of the uterus not only present all the essential characters peculiar to them elsewhere in a remarkable degree, but they also offer numerous important and accidental modifications, some of which exert a considerable influence upon the uterus; it therefore becomes necessary to devote a more extended consideration to them, in addition to the general outline which we have already given. The uterus, as well as the adjoining tissues, are particularly liable to be the seat of fibroid growths. They not only present all the varieties and degrees as regards size and volume, shape, number, and metamorphosis, in so characteristic a form, that we have thought it right to take them as the specimen and groundwork of general disquisitions on the subject, but they also offer the most various modifications in reference to their seat, and consequent reflex influence upon the womb.

We also find that the changes in position of the uterus, the deviations of its shape, and of the direction and form of its cavity, of its size in reference to the coexistent hypertrophy and atrophy of the organ, and the relations of the uterine mucous membrane, &c., are very remarkable.

The three varieties distinguishable in the fibroid tumour, according to its internal structure, are all found in the uterus. The variety in which a concentric disposition of the fibres is displayed, is here also distinguished by its density, hardness, poverty of vessels, smallness, and spherical shape.

The second variety, in which the fibres appear irregularly disposed, and issue from numerous centres or nuclei, present a rounded form, and an uneven, nodulated surface, which indicates the aggregation of the fibrous centres in reference to density and consistency, vascularity and volume, they offer the extensive modifications already spoken of; they may, on the one hand, be very dense and hard, and unvascular; on the other, in consequence of an accumulation of cellular tissue in the interstices of the fibrous layers, they may be more or less vascular and succulent, or soft and elastic, soft and doughy, flabby, &c., sometimes resembling a soft mammary gland, sometimes a coarse-grained salivary gland. Those fibroid tumours, the interstices of which are dilated into cells or cavities, containing a serous fluid from excessive exhalation of the intervening cellular tissue, are of extreme importance. They present fluctuation, and may, on account of the deceptive appearances accompanying fibroid tumours, be easily mistaken for ovarian dropsy, hydrometra, acephalocyst of the uterus, or pregnancy.

The fibrous polypus of the uterus, the third variety of fibroid tumours, takes its origin by a single or divided trunk in the interstitial cellular tissue of the uterine parenchyma; the former expands into striated fasciculi, which are bound together by softer vascular and cellular interstitial substance, and the entire mass presents a distinctly lobulated structure, which is more or less visible externally. The polypus grows into the cavity of the uterus, with which it is in the closest anatomical connexion, and upon the functions of which it exerts a considerable influence. It enlarges chiefly in one direction, and has a cylindrical, fusiform, clubbed, pyriform shape, and is more or less flattened; it is provided with numerous and very large vessels, is apt to swell, and in consequence of excessive congestion and rupture of the vessels, we often meet with extravasation within its tissues.

The anatomical relation of fibroid tumours to the uterine parenchyma is very intimate in the third variety, less so in the second, and least of all in the first, in which the tumours adhere to the uterine parietes by a thin layer of whitish or reddish, more or less vascular, cellular tissue, so that they may be detached without difficulty.

The form of the fibroid tumours of the first and second variety, we have already described as being generally round; in the second variety some alterations may occur, though the globular form still predominates. The peculiarities of shape of the fibrous polypus, or third variety have already been stated. The greatest variety occurs in reference to size. Fibroid tumours are found from the size of a hemp seed to that of a man's head.

The fibroid tumours belonging to the second variety attain the largest size, especially when of loose texture, and rich in interstitial cellular tissue; the fibrous polypi also reach a considerable magnitude, but the fibroid tumours of the first variety are the smallest. They are all generally developed slowly, though the second and third variety are occasionally developed with extraordinary rapidity; they are also liable to a temporary increase of size or tumefaction proportionate to their vascularity.

As to their number, we sometimes only find a single, sometimes several or many fibroid tumours in the same uterus. We then observe tumours of the most different sizes coexisting. This applies chiefly to the first two varieties; the fibrous polypus is often solitary, but it also occurs in company with the others.

The uterine parietes are the seat of the fibroid tumours, but not only do they occur much more frequently in the body than in the cervix, but in the former they chiefly affect the upper portion or fundus. They very rarely occur at the inner orifice, and if possible, still less frequently in the vaginal portion. This is the case with all fibroid tumours, a fact that forms an interesting contradistinction to the relation which cancerous disease bears to the inferior segment of the uterus. Fibrous polypus, more especially, is apt to commence at the fundus, and at the orifices of the fallopian tubes. The fibroid tumour is inserted into, and takes its origin from, the middle layers of the uterine substance, or it appears to be more connected with the external layer, or even to lie under the peritoneum, or again, it lies nearer the inner surface, or immediately under the mucous membrane. The first two varieties are developed in the most various layers, though generally in the external ones; the third forms upon the internal layer exclusively. The former also very frequently present other curious relations, whether they have been developed in the vicinity of the peritoneum, or of the mucous membrane of the uterus. In the first instance the tumour, as it enlarges, gradually becomes detached from the uterus, dragging the peritoneum after it, and thus at last becomes pediculated or pendulous, by a peritoneal cord of various length. In the second instance it pushes the mucous membrane before it, as it enlarges, and at last hangs into the uterus by a mucous pedicle, thus resembling the true fibrous polypus, from which it may be distinguished by its relation to the uterine parenchyma, and by its internal structure.

We must here advert to a circumstance that is not of very rare occurrence, viz. we sometimes find a fibroid tumour in the pelvic cavity, and generally in Douglas's space, without any further connexion with the uterus, except by means of cellular cords, or laminæ of new formation (false membranes), which pass from the tumour to the uterus and its appendages, to the pelvic walls, the rectum, &c. The question presents itself, which is the original point of development of such fibroid tumours. They are generally tumours which have originally been developed under the uterine peritoneum, and, after having become entangled in a network of pseudo-membranous formations, resulting from the peritonitis they have excited, are gradually detached from the uterus. Occasionally, however, they may have been developed within the false membranes themselves, which is the more probable, if we consider that the new tissue as it proceeds from the uterine peritoneum, participates in the character of the subserous uterine cellular tissue. Hence it is extremely likely that we really see very small fibroid tumours occasionally developed in this new tissue.

To these fibroid tumours, the loose fibrous concretions which are sometimes found in the pelvic cavity are allied; they must be considered as fibroid tumours of the uterus, which have become detached in consequence of atrophy of the peduncle.

Metamorphoses and diseases of the uterine fibroid tumours. Spontaneous cure.—We have already spoken of ossification, congestion, inflammation, suppuration, and solution of fibroid tumours generally; and those remarks apply with the more force to uterine fibroid tumours, as we assumed the latter as the foundation upon which we based our observations. Ossification occurs very frequently, congestion less so, and inflammation and its terminations rarely. A spontaneous cure, under which head we must also class ossification, on account of the destruction of vitality in the tumour, occurs in a few rare cases, by a detachment of the fibroid tumour as it projects into the uterus, or is suspended in it by a mucous pedicle. It is effected in the following manner: the mucous membrane of the uterus covering the apex of the tumour is in a condition of permanent irritation and congestion; this is at last converted into inflammation, and terminates in suppuration and gangrene. The tumour is thus partially exposed towards the uterine cavity, and the destructive process gradually involving its entire cellular investment, it becomes detached, and passes through the opening in the uterine mucous membrane into the uterine cavity. Ancient and modern cases are on record, in which fibroid tumours of various sizes and ossified tumours were thus discharged. The powers of nature rarely suffice if the tumours are of considerable size, as the extensive suppuration necessary for that purpose is likely to prove fatal, both by exhaustion and by the extension of inflammation to neighbouring organs. It would appear that the fibrous polypus is occasionally, though very rarely, discharged in a similar manner, in consequence of suppuration occurring at its roots and in the surrounding tissues.

The changes in the uterus, consequent upon the presence of one or of several large fibroid tumours, are numerous and important, by reason of the diagnostic characters they afford.

In the first instance, the volume of the uterus increases in proportion to the number and size of the tumours; the fibrous polypus causes an enlargement of the uterine cavity, corresponding to the size of the polypus. The increase in the substance, the hypertrophy of the uterus, which the fibroid growths generally induce, and, on the other hand, the atrophy of the organ, are of greater interest. The hypertrophy appears as a development of the uterine tissue, resembling that occurring in pregnancy; it varies in degree. In reference to the latter subject, the question presents itself by what means the different degrees of hypertrophy are determined, and on account of the occasional passive condition and the occasional atrophy of the uterus, it is necessary still further to generalize, and to ask how it happens that under some circumstances the uterus becomes hypertrophied, in others remains unchanged, and in others again becomes atrophic? In answer, we offer the following remarks:

α. The nearer the fibroid growths approach to the uterine mucous membrane, and project into the cavity of the uterus, and thus maintain the mucous membrane in a state of irritation and inflammation, the more palpable is the hypertrophy of the uterus. It is most fully developed, so as to resemble pregnancy, in the case of the fibrous polypus.

β. Hypertrophy of the uterus appears to be encouraged by a vascular state of the tumour, by the latter being less dense and capable of rapid growth.

γ. As also by the development of the tumour, during or shortly after the period of conceptivity.

δ. The size of the tumour exerts no direct influence upon the origin of hypertrophy or atrophy.

ε. Atrophy undoubtedly results very rarely from fibroid tumours, nor must we forget that they are not unfrequently developed in the uterus during the period of decrepitude, and that they increase very slowly on account of the universal state of marasmus. In this case the atrophy of the uterus is entirely independent of and antecedent to the fibroid tumours.

The atrophy of the cervix accompanying large fibroid growths is, as we shall have occasion to explain more fully, the result of mechanical traction.

An important change takes place in the position of the uterus, which may be discovered by external examination. Not only does a large fibroid tumour that occupies the external layer of the uterine tissue, push the organ to the opposite side of the pelvis, but we also notice a remarkable ascent of the organ. The more numerous and the larger the tumours are, and the more they consequently rise out of the pelvis, as it interferes with their growth, the more they drag the uterus after them; its vertical position being also changed in proportion as the fibroid tumours preponderate on one side or the other. This traction necessarily causes an elevation and elongation of the cervix.

The external surface of the uterus is, as may be easily understood, variously disfigured by the projecting tumours. In the same manner the cavity of the uterus, in addition to a corresponding elongation, undergoes various alterations in form and direction, proportionate to the number and size of the tumours which project internally. In reference to the displacement, we sometimes find the entire cavity forced out of the mesial line, at others it presents more or less angular deflections. The most important disfiguration is effected by the upward traction exerted by numerous and large fibroids. The uterus, and particularly the cervix, is elongated to a degree proportioned to the degree of traction, it becomes thinner, and the attenuation may, in rare cases, even cause a gradual solution of continuity, one portion remaining attached to the vagina, another following the upward direction of the uterus, and the connexion being maintained by a mere band of cellulo-fibrous tissue. The channel of the cervix at the same time contracts, and may even become entirely obliterated. The vaginal portion gradually disappears, the vagina itself becomes smooth and narrower in consequence of the elongation, and its arch is converted into a funnel, the apex of which terminates in the os uteri.

If one or more fibroid growths occupy a lateral portion of the uterine parietes, and especially if they be seated in the vicinity of the fallopian tubes, the external form of the uterus may be rendered oblique; if under these circumstances the tumours enlarge, and consequently exert lateral traction, this may be recognised by the elevation of the corresponding side of the os tincæ, and the increased distension of the vagina.

Fibrous polypus gives rise to a dilatation of the uterine cavity, and of the cervix, corresponding to the size of the morbid growth; if the enlargement proceeds to a greater extent, the external orifice becomes dilated, and the tumour projects through it into the vagina. Large and heavy morbid masses of this description frequently cause a slight descent of that portion of the uterus into which they are inserted, by the traction they exert, and sometimes even induce complete inversion of the womb.

The mucous membrane of the uterus is the more liable to catarrh and blennorrhœa, the nearer the fibroid tumour approaches to it; sometimes it becomes hyperæmic, and blood is effused upon it. This is particularly the case with the fibrous polypus, which is not only accompanied by the ordinary hemorrhage from the capillaries of the mucous membrane, but also from larger vessels of the uterus, or sinuses of the morbid growth that have given way to excessive traction.

Fibroid tumours of the uterus scarcely ever occur before the twentieth year; a fact which is established by the numerous observations made by ourselves and other anatomists. They are even unusual up to the thirtieth, and present themselves most frequently shortly after the fortieth year. Without entering into an analysis of the almost innumerable cases that we have ourselves met with, we may mention the results of Bayle's calculations as to the frequency of their occurrence; he states that of one hundred females that die after the thirty-fifth year of life, twenty at least are affected with fibroid tumours.

They are found in complication with the most various morbid growths of the uterus and its appendages; but especially with cancer of the cervix, with the corroding ulcer of the os tincæ, with ovarian dropsy, &c., still on the whole the complication with cancer is not frequent.

The powers of conception are commonly not impaired by the presence of fibroid tumours, and if these are small, and do not occupy an unusual position, they have not necessarily an injurious influence upon pregnancy and parturition, though they frequently cause abortion and hemorrhage after birth. Parturition may be very much impeded if they occupy the cervix uteri. It is important to know that these tumours become more vascular, succulent, and softened during pregnancy, and assume a bluish-red colour, so that their original appearance is entirely changed. As the uterus returns to its original shape, the morbid growth also resumes its ordinary characters. Pregnancy is even said to give rise to hemorrhage and inflammation in the tissue of the fibroid tumour.

An unusual though very important occurrence, brought on by the excessive expansion and traction exerted by large fibroid tumours, is the laceration of the vessels, and especially of the veins. We have once observed the rupture of a vesical vein (with that of the mucous membrane) followed by hemorrhage into the bladder, and in another case the rupture of the subperitoneal vein of a fibroid tumour, with hemorrhage into the abdominal cavity, as described by other writers.

Ligature of the fibrous polypus is sometimes followed by uterine phlebitis.

5. *Osteoid growths.*—We have not met with osseous formations in the uterus, except in the shape of ossification of the fibroid tumours.

6. *Tubercle.*—Tubercle occurs primarily as tubercle of the uterine mucous membrane; the uterine parenchyma is like the submucous muscular layers, only attacked secondarily by tubercle.

It generally occurs in the uterine mucous membrane in the shape of an infiltrated mass, which fuses into and attacks the uterine parenchyma to a greater or less extent. The mucous membrane appears converted into a fissured, cheesy, purulent mass of tubercle. The cavity of the uterus contains tubercular pus, which may be retained in consequence of closure of the orifice, and accumulate so as to cause a globular distension of the organ. The disease is very rarely observed in its early stage, in the shape of scattered or grouped gray miliary tubercle of the mucous membrane and the adjoining submucous tissue.

Uterine tubercle is formed during childhood, in the period of puberty, and during the prime and even, though rarely, during the decline of life. It is most frequently complicated with tubercle of the fallopian mucous membrane, and with the latter may constitute the primary tubercular affection. It is also found complicated with abdominal tubercle, and especially of the abdominal lymphatic glands, and of the peritoneum; and may serve as a point of discharge for the latter. A translation of the tubercular disease to the urinary passages is very rarely observed.

It is curious that the tubercular deposit stops short at the cervix, and very rarely passes even beyond the internal orifice of the womb; the vaginal portion is never affected with tubercular disease. This is extremely remarkable on account of the marked contrast offered by carcinoma, both in reference to its primary and secondary development.

7. *Carcinoma.*—Next in frequency to fibroid growths is the occurrence of cancer. It always attacks the cervix in the first instance, and especially that portion which projects into the vagina; the primary occurrence of carcinoma at the fundus uteri is so extremely rare, that the above observation may be considered as an absolute rule. It is contrasted in this respect with fibroid and tubercular disease of the uterus, and it presents a similar contrast in reference to its extension and ulcerative destruction.

According to our observations, fibrous cancer very rarely affects the uterus; the most common form is the medullary, either by itself or complicated with the former.

Opportunities very rarely present themselves of investigating the early stages of cancer in the dead subject; according to a few observations, fibrous carcinoma, when closely examined, appears to consist of dense whitish, retiform fibres, differing from the normal texture of the vaginal portion of the uterus in which they are found, and in their very minute meshes a pale reddish-yellow or grayish translucent substance is deposited. This morbid growth is inserted into the uterine tissue without well-marked boundaries; it occupies a various extent, and from accumulating at certain points, gives rise to the irregular nodulated character and the well-known induration which accompanies the enlargement of the cervix.

Medullary cancer in the first instance appears as an infiltration of a white lardaceo-cartilaginous or lax encephaloid matter, in which the uterine fibre disappears; as the deposit increases the vaginal portion assumes an uneven nodulated character, and appears hard and elastic to the touch. Cancer of the uterus very rarely presents itself in the shape of isolated globular growths.

As the cancerous degeneration proceeds, and especially on the commencement of the stage of metamorphosis, with its consequent new formations, particularly if they belong to the medullary variety, the lower segment of the uterus undergoes a very considerable and rapid enlargement. At last we find a callous, loose, spongy ulcer developed in the usual manner, which discharges a very fetid, greenish-brown, sanious and sanguineous fluid, and as it extends, generally causes a progressive infiltration of cancerous matter. The tumefaction of the cervix and the fungoid excrescences not unfrequently close up the orifice, and the consequent enlargement of the womb will be the larger, the more copious the secretion of the mucus.

Cancerous degeneration of the uterus is generally confined, in a very remarkable and distinct manner, to the vaginal portion; still there are frequent exceptions to this rule, as the disorganization is sometimes found to extend with great rapidity to the body, and even to the fundus of the uterus; this is particularly the case if the os tincæ has already been attacked by ulceration. The disease may spread downwards and involve the vagina, thus establishing vaginal cancer. It may extend in other directions, and thus give rise to cancerous degeneration of the rectum, the bladder, the pelvic, cellular, and adipose tissue, and the periosteum; the uterus thus becomes fixed in the pelvis, and at last we find the peritoneum attacked, cancerous growths being formed upon it and in its tissue, or perforating it, especially in the shape of medullary masses.

Cancerous ulceration spreads in the same direction; in rare cases we find the greater part of the uterus, and even its fundus, destroyed. The destructive process, when attacking the vagina, sometimes prodominates on the anterior, sometimes on the posterior surface; sometimes it attacks both equally, and may extend downwards almost to the external orifice. It also involves the degenerated parietes of the rectum and of the bladder, and generally produces extensive communications between their cavities and the original cancerous sinus (ulcerous cloacæ). It finally extends, in the shape of sinuous passages, through the remainder of the cancerous mass that fills the pelvic cavity, to the pelvic bones. In this manner a large cavity with fungoid parietes is at last established, which occupies the greater part of the uterus and the vagina, and opens into the cavities of the rectum and the bladder; above it is closed in by the fundus uteri and the adherent rectum and cervix vaginæ, as also by the cæcum and small intestine, which are agglutinated to these parts, and at last it penetrates into the cavity of the peritoneum or the intestines. The contents of the cavity are cancerous ichor mixed up with fæcal matter, urine, and portions of gangrenous tissue.

The temporary and tumultuous periods of development presented by the peritoneal inflammations of the pelvic and hypogastric regions, which accompany and characterise the metamorphic and ulcerative stages, and which not unfrequently extend from the original layer over the entire peritoneum, are important occurrences in the progress of cancerous disease.

Uterine cancer is, in most cases, a primary disease, and generally remains for a long time, if not throughout, the sole carcinomatous affection of the organism. However, it is sometimes developed concurrently with or consecutively to mammary and ovarian cancer; or it is accompanied by degenerations of the adjoining tissues above mentioned, and of the lymphatic glands, which must be explained upon the theory of propagation by contact; or again, it is associated with cancer of the peritoneum, of the liver, the stomach, and the breasts, with cancer of the bones, with mollities ossium, ovarian cancer, and universal cancerous deposit, as a consequence of the resulting cancerous dyscrasia.

Uterine cancer most frequently occurs between the fortieth and fiftieth year; still there are many cases on record in which it appeared between the thirtieth and fortieth year, and even earlier.

The cases of spontaneous recovery from uterine cancer are of extreme rarity, but they do occur; the carcinoma and the cancerous ulceration are then limited to the cervix, the internal orifice forming the boundary; the loss of substance heals with a funnel-shaped cicatrix.

We append to the above remarks on uterine cancer a brief account of the so-called—

8. *Cauliflower excrescence of the os uteri,* which we are inclined to consider as of a cancerous nature. It is of very rare occurrence, and we have only once observed it in the living subject, in a form similar to that described and delineated by Clarke. It presented the appearance of a confervoid growth, consisting of lenticular, pale red, transparent, and tolerably hard corpuscles, strung together like the beads of a rosary, projecting on the orifice of the uterus into the vagina, and bleeding on the slightest touch. It was developed and grew from an evidently cancerous base of the medullary variety.

Clarke states, that it also occurs without this complication, and that it is curable; the unfrequency of its occurrence and the circumstance that after death it collapses, and merely appears like a slight accumulation of delicate cellular tissue, render it difficult to decide the question as to its cancerous nature; this, however, is the view we are inclined to adopt.

The chief and very dangerous symptom which the affection presents are frequent exhausting hemorrhages, which are brought on by the most trivial causes. It is said to occur at any period of life after the twentieth year, but very rarely before that.

SECT. II.—DISEASES OF THE UTERUS AFTER PARTURITION.

Under this head we include diseases to which the uterus is liable in consequence of the puerperal state, which are essentially (in reference to causation) connected with the latter, and especially with the concurrent detachment of the membranes and the placenta from the inner surface of the uterus, and which, for that reason, must be termed puerperal affections. We pass over the subjects which have already been discussed, and enter at once upon the consideration of these diseases in the following (natural) sequence.

§ 1. *On defective and irregular Contraction and Involution of the Uterus after Childbirth.*—We occasionally find that the uterus presents a condition of universal flabbiness or collapse of its parietes, accompanied by a trifling reduction of size, which must be considered as paralysis from exhaustion, and which results from tedious or instrumental labour, or from parturition, the first stages of which had been much accelerated. In other cases, and they are of frequent occurrence, we find the fundus and the neighbouring parts of the corpus uteri to be the seat of excessive contraction and energy, whilst the inferior segment is in a contrasting state of atony and collapse; there are other cases again in which excessive contraction prevails at the middle of the uterus forming a zone round it, or at smaller and less defined portions. These occurrences may be brought about by the most various impediments to parturition, by pressure, contusion of the uterus, apoplexy of the womb (vide page 287), by original irregular innervation of the uterus, &c. As may be supposed, they give rise in the first instance to hemorrhage, and in consequence of this and of the general debility, they impede the further involution of the uterus, and thus protract the disposition to puerperal affections. We must here mention a very singular circumstance, which may, on account of the consequent danger, become important, and may even be misunderstood in post-mortem examinations; it is paralysis of the placental portion of the uterus, occurring at the same time that the surrounding parts go through the ordinary processes of reduction. It induces a very peculiar appearance. The part which gave attachment to the placenta is forced into the cavity of the uterus by the contraction of the surrounding tissue, so as to project in the shape of a conical tumour, and a slight indentation is noticed at the corresponding point of the external uterine surface. The close resemblance of the paralysed segment of the uterus to a fibrous polypus, may easily induce a mistake in the diagnosis, and nothing but a minute examination of the tissue can solve the question. The affection always causes hemorrhage, which lasts for several weeks after childbirth, and proves fatal by the consequent exhaustion. We have met with it twice, once after abortion, and once after parturition at the full period.[1]

Lastly, we observe that the contraction and involution of the uterus is more or less permanently impaired by all the different puerperal inflammatory processes.

§ 2. *Puerperal Inflammations.*—Puerperal inflammations generally, are in most cases of a very complicated nature, and it is of extreme scientific and practical importance that we should obtain a comprehensive sketch of their anatomical bearings, as well as an analysis and correct interpretation of the constituent phenomena. If we consider puerperal inflammation of the uterus by itself, we find that it always appears in the shape of an exudative process, affecting the raw exposed surface of the uterus to which the placenta had been attached; in reference to its original seat, it must therefore always be considered as endometritis. We shall first have to examine into the characters of this affection, and then proceed to investigate other important puerperal diseases; after which, we shall give a summary and an analysis of changes taking place in organs and tissues that do not belong to the original seat of disease, and conclude with a consideration of the issues and consequences of primary and secondary puerperal affections.

1. *Puerperal endometritis.*—This affection, as has already been observed, is invariably an exudative process; but it offers the greatest variety, both in reference to the plasticity of its product and to the condition of the diseased tissue, either in individual cases or in entire epidemics. The series is almost endless, but we may consider genuine uterine croup on the one hand, and the so-called genuine putrescence of the uterus on the other, as its extremes; the very fact of this great multiplicity of forms obliges us to limit our descriptions to the most prominent ones.

In certain cases we find the internal surface of the uterus lined by a yellowish or greenish dense exudation of greater or less thickness and extent, either in small patches or investing the entire uterus, and either firmly or loosely agglutinated, and occasionally partially or entirely detached from the subjacent tissue, so as to appear corrugated or plicated. The uterine mucous membrane under the lymphatic coating is found reddened, tumefied, and slightly softened; the free parts are discoloured, and invested with a dirty reddish or brownish secretion, and with remnants of the deciduous membrane. The exudation generally interpenetrates largely the exposed raw tissue of the placentar portion of the uterus, and causes it to assume a peculiar ulcerated appearance. This is uterine croup.

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[1] Dr. Betschler, during his visit to Vienna in 1840, communicated a similar case to me as having occurred at Breslau; and there can be little doubt that Dr. Burkhardt (vide Berliner Centralzeitung, x, 19) speaks of this condition, under the title of acute fungus hæmatodes uteri, as of a new and hitherto unknown cause of flooding after childbirth.

In other cases the exuded matter is a gelatinous, purulent, dirty yellow, loose and easily detached layer, beneath which the internal stratum of uterine tissue appears spongy, infiltrated, soft, and may be easily detached in the shape of a dirty yellowish-red, or partly greenish and brownish pulp. The internal surface of the uterus presents, in addition to the lymphatic exudation, a glutinous secretion of a similar tinge.

Again, the internal surface of the uterus may not present a trace of coagulable lymph, but be invested by a purulent sanious and very discoloured exudation, beneath which we find the uterine mucous membrane infiltrated in more or less extensive, or circumscribed patches with a similar product; and it may either be easily removed in the shape of a thin and much discoloured pulp, or it has already become detached, and is mixed up with the contents of the uterus in the shape of friable discoloured flocculi. In the place of the destroyed tissues, we occasionally discover the products of a reactive process, in the shape of a more or less consistent sanio-purulent secondary exudation.

Again, the internal layer of uterine tissue may be covered with a thin, opaque or more dense, pale green or brownish, or dark chocolate or coffee-coloured product, beneath which it is converted, to a greater or less depth, into a loose, infiltrated, fetid pulp, of a similar tint. This condition, which differs from ordinary sphacelus, has been termed putrescence of the uterus.

All these characters point to an exudative process, the peculiar nature of which is fixed by the form of its product, and the condition of the substratum, and especially by the state of fusion of the latter. There are numerous states of transition between the forms described, and they not unfrequently become complicated with one another in such a manner, that a process of a malignant nature follows one that is accompanied by a secretion of plastic lymph. As primary exudative processes, they are, if possible, to be distinguished from similar secondary processes which may occur in the course of the disease in consequence of a secondary affection of the blood, resulting from inflammation of the veins or lymphatic vessels.

As supplementary to the above, we have to examine those anomalies presented by the uterus, which are either direct reflexes of the processes in question, or which occur as accidental complications.

To the former appertain paralysis of the uterine fibres and impeded involution of the uterus in various degrees. According as the puerperal affection attacks the uterus, sooner or later after parturition or with more or less intensity, the womb is found of greater or less size, more or less relaxed, collapsed, softened; and certain portions that contain a large amount of cellular tissue, such as the lateral edges and the cervix, are infiltrated with a pale yellow, sero-gelatinous, or sero-purulent fluid. The external surface of the fundus and body of the uterus not unfrequently exhibit numerous shallow depressions, that are caused by the pressure of adjoining tympanitic coils of intestine.

Among the accidental complications we reckon sanguineous engorgement (apoplexy) of the neck of the uterus, the superficial or profound lacerations and contusions which occur at this point, and in the vaginal segment; the lacerations being invested with exudation of a more or less plastic character, whereas the contused parts not unfrequently appear in a state of gangrenous solution. We have to mention the sloughs of greater or less dimensions, which occur chiefly at the neck and vaginal portion of the uterus, and also in the vagina and the external genitals, in company with malignant exudative processes. These processes lead to ulceration and gangrenous fusion of the tissues, very often inducing extensive loss of substance in the external sexual organs and the neighbouring parts; they render the prognosis of the individual case very unfavorable, both on account of the character of the original affection, as well as of the consecutive destruction which they entail.

Notwithstanding its close relation to the processes of exudation and fusion, which we have hitherto investigated, we think it necessary, on account of the novelty and scientific interest attached to the question, to devote a separate consideration to the dysenteric process occurring in the uterus after childbirth, or puerperal uterine dysentery.

The appearance presented by the inner surface of the uterus varies according to the intensity of the disease. In one case it is uneven, nodulated, and invested by a dirty reddish or brownish fetid secretion; the projecting parts of the mucous membrane are covered with a grayish-yellow or firm greenish exudation, which here and there presents a furfuraceous exfoliation, and the subjacent mucous membrane itself is generally converted into a yellow slough; the entire surface may thus in the advanced degrees present an appearance exactly resembling the impetiginous condition of the intestine in dysentery. The tissues of the uterus are infiltrated throughout with serum, and, as in the intestine, we find the projections to be more particularly owing to an accumulation of the serous fluid at certain points. In another and more advanced degree, which always runs a very rapid course, the internal layer of the uterus is found degenerated into a brownish-black, friable, loose or detached mass; the uterine cavity contains a fetid matter resembling coffee-grounds; the uterine tissue is flabby, pale, discoloured, and more or less infiltrated with the sanious matter. The process may thus be said to represent essentially, what we must call, if consistent in our terminology, dysenteric putrescency of the uterus.

The uterus in this case is always very large, or, in other words, its involution is eminently retarded.

It is an additional evidence of the nature of this affection, that it is often seen combined with true dysentery, or with the dysenteric process on the mucous membrane of the colon. The puerperal diseases occurring during the prevalence of a dysenteric epidemy therefore deserve a more careful examination and appreciation in reference to this point, both at the bedside and in the dead-room.

These processes are scarcely ever isolated, but are almost invariably complicated with others. The degree of connexion existing between them and the complications, and between the complications themselves, differs very much; we shall consider these points more fully, as we are about to examine the more important of these processes separately.

2. *Inflammation of the veins and lymphatics of the uterus.*—Both, but especially phlebitis, are important puerperal diseases.

Uterine phlebitis is generally a primary affection, originating in the open mouths of the veins at the insertion of the placenta, and caused as well by their laceration as by contact with the external atmosphere, with the traumatic secretion of the part, and with the product of exudation on the internal surface of the uterus. It is either confined to a small portion of the veins, or it spreads over the greater part of the veins of the uterus belonging to the spermatic or uterine system of vessels. In the latter case, a secondary inflammation of the trunk of the spermatic vein, brought on by coagulation of the blood, may on the one hand extend through the vena cava to the right auricle, or on the other along the iliac and the crural veins, to the cutaneous veins of the lower extremity; in this case the symptoms of phlegmasia alba dolens are induced.

The resulting products differ very much. There is no doubt that coagulable lymph is frequently secreted, which causes the venous parietes to become agglutinated to one another, or to a contracting plug of coagulum; but in most cases pus is formed, which is variously discoloured, presents a dirty greenish, or brownish, or chocolate-coloured hue, with a fetid odour, varies in density, and is more or less sanious (septic phlebitis). In consequence of exacerbations, the same portions, or, if the disease extends, consecutive sections of the uterine venous system, may present various exudations at the same time or in succession.

Metrophlebitis undoubtedly sometimes occurs as the sole and primary disease, but in the vast majority of cases it is complicated with exudative processes on the internal surface of the uterus. This combination commonly takes place from the commencement, or the phlebitis supervenes upon and is induced by the exudative process; or, lastly, phlebitis may exist for a short period in an isolated form as the primary disease, and give rise to a single or to repeated exudative processes.

We thus find that the combined processes are closely related to one another, in reference to their essential characters and the nature of their product; this and other points will become more apparent from the description of the chief anatomical symptoms which we are about to give.

If incisions be made in various directions from the point of insertion of the placenta, to the lateral parietes of the uterus and the adjoining broad ligaments, a large number of veins become apparent, which are dilated and varicose, and filled with yellow or greenish-yellow viscid pus, or even with chocolate-coloured sanies. Their orifices, at the placental portion of the uterus, are either closed up by loose pale coagula, or they are covered over with an exudation which attaches itself to the spongy tissue of the raw surface, or, lastly, they are exposed so that their contents exude on the application of a slight pressure. The coats of the veins are relaxed and pale, the lining membrane is opaque, and discoloured by the contents of the vessels, and after a protracted duration of the disease it appears tumefied, thickened, partially gangrenous, and ichorous. The tissue surrounding the veins, and especially the cellular tissue at the lateral portions of the uterus, is infiltrated with a yellow gelatinous or purulent matter, which is much discoloured if the contents of the veins are ichorous; the tissue is relaxed, soft, friable, and lacerable. At different points there are abscesses of greater or less dimensions, which not unfrequently burst internally, and discharge their contents into the uterus.

The internal surface of the uterus presents purulent and ichorous exudations, the products of primary or secondary processes, or of both. The tissues throughout are in a state of disorganization or putrescence, becoming dissolved in a manner analogous to the exuded product, and being attacked from the various foci of destruction within the parietes of the uterus themselves. The discoloration advances as far as the peritoneum, and the affection may, therefore, be recognised by the external appearance, as well as by the general habit of the organ. The fusion occasionally predominates at one portion of the placental segment of the uterus, involves the entire thickness of the parietes, and causes the portion to be detached, and to pass into the uterine cavity in the shape of a pulpy, discoloured, semifluid plug.

Uterine phlebitis often runs a rapid course, with intense typhoid symptoms, proving fatal by uterine paralysis; or it proceeds more slowly under circumstances preventing a general infection of the blood, even when the product is of a putrid character, and then proves fatal by the secondary destruction set up.

Inflammation of the uterine lymphatics is, on the whole, less frequent than phlebitis, and is generally complicated with the latter. When it occurs, the lymphatics, and particularly those of the lateral and posterior portions of the uterus, of the ovary, and the fallopian tubes, become dilated and varicose, their coats pale and opaque, the lining membrane dull and furred, and they contain a yellow, yellowish-green, purulent fluid. By these characters they may be traced into the neighbouring hypogastric and lumbar plexuses, and into the associated glands, of the lymphatic system.

Inflammation of the veins and lymphatics of the uterus is generally the source of secondary occurrences, the so-called metastases, or lobular foci of inflammation (lobuläre Entzündungsheerde), in the most various tissues and organs, as well as of exudative processes occurring in serous and mucous membranes during the later stages of puerperal disease.

3. *Inflammation of the peritoneum (peritonitis puerperalis), viewed in connexion with puerperal inflammations of other serous membranes.*—Peritonitis is known as a very common puerperal disease; in rare cases it actually constitutes the original (primary) puerperal exudative process, and as such remains isolated. It more frequently simulates this form, inasmuch as the processes with which it was originally complicated have become retrograde or imperceptible, or have actually ceased after the discharge of their products has been effected. We most frequently find it complicated with the puerperal affections already examined—viz. with the exudative processes occurring on the internal surface of the uterus, with metrophlebitis and inflammation of the uterine lymphatics. The pathogenetic relations of puerperal peritonitis, and especially its relations to the last-mentioned puerperal processes, have been much discussed, but the subject has not as yet been adequately elucidated.

We commence with a statement of the anatomical signs presented by puerperal peritonitis, in reference to its extent and terminations, the quantity and quality of the effusion, and the coexistent degree of reddening and vascular development.

Puerperal peritonitis is not unfrequently limited to the peritoneal covering of the uterus and its appendages, when it presents more or less redness, with more or less distinct congestion and a thin partial lymphatic exudation, or a more dense and extensive layer of a viscid and consistent or loose and fluid secretion.

We not only find the peritoneal covering of the internal sexual organs attacked in this way, but also the peritoneum of the entire hypogastric abdominal region. The disease may even spread over the whole parietal and intestinal peritoneal laminæ; the symptoms, however, at the same time predominating on the peritoneum of the internal sexual and adjoining organs.

The entire peritoneum is often uniformly involved in the disease, not only without any predominance of the symptoms in the sexual organs, but sometimes even with an apparent subordination of these symptoms.

The products of these processes vary very much; they may be firm, yellowish-gray concretions, loose, yellowish, membranous, grumous, gelatinous, or fibrinous coagula, which glue the intestines to one another, or to the parietes of the abdomen, or they may be yellow and greenish-yellow, thin, sero-purulent or thick purulent, dirty green and brownish, red, hemorrhagic, thin, opaque, sanious effusions, the result of septic peritonitis. The product is sometimes very limited in amount, and may merely present a thin covering of the internal sexual organs, or a few membranous or fibrinous flocculi of coagulable lymph, scattered through the abdominal cavity; but in the case of universal peritonitis it is generally extremely copious, whatever the particular variety of the product.

The vascular development and redness is, especially in the last-named cases, very slight, and bears a marked disproportion to the quantity of the exudation.

This fact in itself, and more particularly when examined in connexion with combined processes occurring in the uterus, and numerous analogies and observations made at the bedside, justify the views we are about to propound, relative to the genesis of puerperal peritonitis and its connexion with puerperal processes in the uterus.

Puerperal peritonitis not unfrequently arises by mere contiguity of tissue, from an exudative process affecting the internal surface of the uterus, or from metrophlebitis. It may remain confined to the internal sexual organs, or become generally diffused, and this occurs the more frequently the more the following circumstance prevails.

The disease is often, and even generally, the result of a primary condition of the blood of the female which predisposes to exudative processes, and is totally distinct from the physiological tendencies of the blood during pregnancy. This proclivity is evidenced by exudative processes on the mucous membrane of the uterus, the intestine, and various serous membranes, by exanthematic processes on the superficial integuments, by a revival of tubercular disease, &c.; and both epidemic and endemic influences and individual causes give it a peculiar character which becomes apparent in the product.

Under such conditions peritonitis will be the more liable to arise, the more the peritoneum has suffered by the revolutions in its local relations during parturition, by the excitement of the large organ, the uterus, which it invests, and by the concurrent disturbances in the circulation; the more exudative processes, or metrophlebitis, and various reactions consequent upon uterine lesions, occur in the vicinity of the peritoneum, and especially in the uterine mucous membrane; the more the peritoneum has been previously affected by the contiguity of tissue to the internal sexual organs.

In this case peritonitis is a primary disease, and is either the first and not unfrequently the only puerperal affection, or it occurs, as is more frequently the case, concurrently with an exudative process of the uterine mucous membrane, or soon becomes associated with the latter; it invariably takes its origin in the above-mentioned predisposition existing in the blood.

Like other exudative processes that occur simultaneously or consecutively, we also find that peritonitis is often the result of a secondary disorganization of the blood, caused by the absorption of the products of exudation upon the external surface of the uterus, or by the direct admixture of the products of metrophlebitis with the blood. In this case it presents the characters of a secondary inflammation, and is commonly complicated with exudative processes on other serous, synovial, and mucous membranes, and with capillary phlebitis in the most different organs and tissues, the so-called lobular infarctions (Lobular-Infarcte) and abscesses.

The products of the peritoneal inflammation in either case correspond in character with those of the exudative processes affecting the internal surface of the uterus and of metrophlebitis, whether they occur simultaneously, or whether they precede the former.

Puerperal peritonitis is developed with more or less rapidity, and in the majority of cases proves fatal by inducing abdominal paralysis; or it leaves various morbid sequelæ. Those exudative processes are remarkable which result from a very rapid disorganization of the blood, and prove fatal within a few hours, or within two to three days, and are accompanied by paralysis and collapse, affecting the uterus immediately after parturition, and by a sanguineous ill-looking effusion.

Puerperal peritonitis, as may be gathered from the above, is almost always remarkable for its very exudative, or croupy, character.

4. *Puerperal inflammation of the ovaries and fallopian tubes.*—We shall examine these affections when we speak of the diseases of the respective organs. The first is always complicated with one of the processes that have been just discussed, and probably always with an exudative process on the inner surface of the uterus; the affection of the fallopian tubes is invariably the result of an extension of the uterine exudative process.

5. *Phlegmasia alba dolens* (*sparganosis*).—Various theories have been formed in reference to this disease of the puerperal state, from its symptoms in the living subject; and very different views have been even propagated with regard to its anatomical relations. The ancient and modern dicta that were based upon anatomical investigations may almost all be viewed as the result of preconceived notions, and of examinations, undertaken with a view to establish favorite theories, or conducted without the necessary distinction between essential and accidental circumstances being observed. It is only of

late that the subject has been examined in the dead body with an unprejudiced and discriminating judgment, and that an anatomical basis has been obtained, which, though it may not be applicable to all conditions that are included under the head of phlegmasia alba dolens, and though it may not always have been properly interpreted, still appears to afford sufficient security.

Two lesions seem to be essentially connected with this affection. It either depends upon an inflammation of the veins of the inferior extremity, and especially of the crural vein, or upon an inflammation of the cellular tissue, which gives rise to the most various products. The latter form is particularly likely to cause the characteristic symptoms which a so-called sero-lymphatic or sero-purulent product, i. e. fibrinous or purulent exudation diluted by a large amount of serum, induces. It is characterised by very slight reddening and vascularity, and must be considered as an exudative process. In this shape it often extends to the crural fasica, the neurilemma, the lymphatic vessels, and is sometimes complicated with exudations in the synovial capsules of the knee and the hip-joint. As we have already observed, it gives rise to the most various products, and terminates accordingly in tedious œdema, in sclerosis, suppurative fusion, and gangrenous destruction of the cellular tissue. It proceeds from a primary or secondary dyscrasia of the female, and is in either case generally combined with various other puerperal processes. This form of phlegmasia alba may, like the one that originates in phlebitis, occur, if similar causes prevail, independently of the puerperal state, in unmarried women and men; and we find this to be particularly the case as a result of exanthematic and typhous processes, of the most various exudative processes, of cholera, dysentery, inflammation of the lining membrane of the vessels, of endocarditis, &c. The disease may attack the upper extremities, and even the trunk, though in the puerperal state it generally affects the lower extremities. It occasionally proves fatal by its sequelæ, but more frequently by the associated puerperal processes.

Crural phlebitis generally passes from the uterine to the internal iliac vein, and either attacks the deep-seated or superficial veins, or both. An inflammation of the lymphatic vessels is often superadded.

Summary of the Anomalies in other Organs, accompanying the above-described processes.

Besides the changes which occur in the original seats of the puerperal processes hitherto examined, there are so many, important, and various anomalies in other organs and tissues, that it is not sufficient merely to give a supplementary account of the anatomical results, but that as copious an explanation of them as possible, becomes necessary. We shall, in the first instance, describe and account for the general appearance of the body, and the individual organs, and then arrange the separate morbid processes as much as possible in groups, according to their mutual resemblance.

The dead subject presents a remarkable disfiguration of the countenance, tumefaction and discoloration of the external genitals, excoriation, ulcerative destruction of various characters, with or without laceration of the perineum, various vaginal discharges, tympanitic distension of the abdomen, a livid erythema of the common integument at different parts of the body, white and often large coalescing miliary vesicles on the thorax and abdomen. Yellow, greenish, bilious, feculent, chocolate-coloured fluids escape from the mouth.

The abdomen presents, in most cases, even if the peritoneal inflammation has been slight or entirely absent, a tympanitic distension of the intestines; this symptom is most developed in universal peritonitis; the entire intestine is then so much distended by gases, that it causes impressions upon the uterus, and forces the epigastric contents of the abdomen into the cavity of the diaphragm, and with the latter into the thorax as far as the fourth and third ribs. The firmer the exuded (plastic) matter, the more firmly the intestinal coils and the other abdominal organs are agglutinated to one another and to neighbouring organs. The coagulable lymph is chiefly contained in the lower segment of the abdominal and pelvic cavity, but also in the lateral parts of the abdomen, between the mesenteries and in the vicinity of the large epigastric viscera, within spaces that have become more or less circumscribed by the adhesions. It not unfrequently causes, especially on the surface of the liver, shallow depressions, and gives to the superficial layer of this organ, if of a purulent and sanious character, a greenish, and to the spleen a blackish, tinge. The reddening and vascularity of the peritoneum are generally inconsiderable; but most evident at those parts which are free from pressure, and take the form of narrower or broader striæ. The membranes of the intestinal canal are all tumefied, the interstitial cellular tissue infiltrated, the layers easily distinguishable and lacerable. The intestine generally contains, in addition to a large quantity of gas, a yellow, serous, feculent fluid, which mounts up to the duodenum and stomach. This fluid is in part the product of an exudative process that occurs in the greater part of the intestinal mucous membrane, and which we shall have occasion subsequently to examine more closely. The duodenum and the stomach may also be found to contain a copious amount of yellowish-green or intensely green biliary fluid.

We have here to advert briefly to two symptoms that occur during the course of puerperal peritonitis, and which not unfrequently coexist—they are, vomiting of the biliary matters contained in the duodenum and the stomach, and of the sero-feculent matters that rise from the intestine, and diarrhœa. The former is to be explained by the paralysis of the muscular coat of the intestine, caused by the peritoneal exudative process, and the fixation of the intestine by plastic exudations; it commences at the duodenum and the stomach, the peritoneal covering of which generally remains unattached. The latter is caused by the exudative process, and the consequent irritation of the intestinal muscular coat, which forms a counterpoise to, and even counteracts, the paralysis at some points; it is the more frequent and the more considerable the less marked the paralysing influence of the peritoneal affection is.

Almost all organs appear in a state of relaxation, which is proportioned to the primary or secondary dyscrasia of the blood, and to the extent in which the blood has become deprived of its fibrine by the fibrinous exudations caused by inflammations of the peritoneum, the pleura, &c. It is owing to a moistening or imbibition of the tissues with the attenuated serum of the blood, which easily exudes through the vascular coats, and is for the same reason coupled with pallor or discoloration, owing to the colouring matter which adheres to the serum. In the abdomen we find that the kidneys and the liver are chiefly distinguished by the softening, pallor, or pale red discoloration, œdema and imbibition, relaxation and friability of their tissues. In the thoracic cavity, the lungs are chiefly affected by these and similar deviations; the muscular portion of the heart, too, is, like the other muscles, and especially those that are involved in the peritoneal inflammatory process, soft, pale, moist, and lacerable. All the serous membranes and the lining membrane of the vessels are infiltrated with serosity, and are more or less reddened, and the serous cavities contain various quantities of a transuded, pale or dark red serum. The brain alone, as in numerous other allied processes, e. g. in typhus, forms an exception, inasmuch as it appears denser and harder, drier and paler, than usual.

The spleen is very frequently, though not always, tumefied; it is so particularly in secondary disease of the blood, whether or not accompanied by the secondary processes (deposits), that we shall subsequently have to notice.

The lungs are reduced in size, and denser, in consequence of the upward pressure exerted by the contents of the abdomen; their inferior lobes are of a dark purple colour, and in a condition of passive hyperæmia.

We now proceed to enumerate the separate morbid processes in the different organs, and to point out their relations to the original puerperal disease.

Our first attention is due to the exudative processes on the various mucous and serous membranes. That affecting the intestinal mucous membrane is of particular importance. The entire tract is generally involved; it is but slightly reddened, and commonly exhibits a thin, watery, serous, or viscid gelatinous, or gelatino-purulent or genuine purulent product; the tissue fuses, and the submucous cellular tissue is more or less infiltrated. In this manner the diarrhœas of the puerperal state are established. The exudation is rarely of a firm, fibrinous, or croupy nature, but most commonly its serous character predominates, and this is the more the case the larger or more fibrinous the product, resulting from a coexistent attack of peritonitis. In certain cases the process that takes place on the mucous membrane of the colon assumes a dysenteric type, and as in the above-named forms, corresponds to the exudation upon the internal surface of the uterus or to the product of metrophlebitis. Similar processes, though generally accompanied with a coagulable product, are occasionally discovered upon the mucous membrane of the stomach, the œsophagus, and the bladder, and in the lungs in the shape of (partial) aphthous pneumonia; this is chiefly the case when the blood has not been exhausted of its fibrine.

Among the exudative processes that take place on serous membranes, the most frequent, after that occurring on the peritoneum, is pleuritis, which is often coexistent with peritonitis; pericarditis is of less frequent occurrence. We also meet with exudations in the synovial bursæ, and especially in that of the knee-joint, the sterno-clavicular and humoral articulations, and, lastly, in the capsule of the humor aqueus. The exudations are generally very copious, fibrinous, and purulent. A thin soft exudation is often found upon the dura mater, accompanied by a slight reddening of the latter.

All these processes may be variously combined, and they are dependent upon the primary or secondary disorganization of the blood, and especially upon that caused by the absorption of pus in metrophlebitis.

Next in order come the processes dependent upon secondary phlebitis of the larger veins, and of the capillary venous systems of various organs and tissues.

The former are generally developed in the vicinity of the original morbid affection, as in the plexus pampiniformis, the trunk of the internal spermatic vein, the internal iliac and crural veins; though they frequently, too, are generated at a distance, as in the cerebral sinuses and the pulmonary artery. These give rise to the so-called metastases or lobular abscesses, which we shall now proceed to examine.

We often find larger or smaller circumscribed spots in the most various organs and tissues: the dark red points of congestion, or small accumulations of pus or sanies, which we have repeatedly adverted to. They are remarkably frequent and numerous in the organs of sanguification, especially in the lungs and the spleen; they are next seen in the kidneys, and more rarely in the liver; they are occasionally met with in the brain, in the thyroid and parotid glands; in all muscles, particularly in the heart; in fibrous tissues, as in the dura mater and the periosteum. Again, they are very common in the mucous tissue, especially of the bladder and the intestines; they occur throughout the cellular tissue, but they seem to predominate in the cellular tissue of the extremities, of the mediastina, of the neck, the iliac muscles, and the intestines and stomach.

We have already demonstrated that these processes are either genuine exudative processes, or that they consist in a coagulation of the blood within the capillaries (capillary phlebitis). In the latter case the coagulum fuses in a manner corresponding to the disease of the blood, and to the deleterious matter absorbed into the blood, and forms a purulent sanious fluid or gangrenous pulp (metastasis puerperalis septica).

They may probably be invariably considered as the result of a secondary infection of the blood, of a poisoning of the blood by the introduction of some product from the original nidus of disease, and particularly of venous pus and sanies in metrophlebitis. They consequently always give rise to purulent and sanious products, and terminate fatally as capillary phlebitis. They enter into various combinations with one another, and with the exudative processes occurring upon serous and mucous membranes. Owing to their position at the surface of the organs, we always find that pleurisy supervenes upon their occurrence in the lungs, and peritonitis upon their deposition in the spleen.

A black softening of the mucous membrane of the fundus ventriculi, or of the œsophagus, or of both at the same time, which is indicated during life by the vomiting of black coffee-grounds-like matter, is of frequent occurrence. It not rarely reaches that degree of intensity, that the fundus of the stomach, and sometimes the diaphragm also, and the œsophagus, with the adjoining cellular tissue and mediastinum, are ruptured, and the fluid that would have been evacuated by the mouth is effused into the abdominal or thoracic (especially the left) cavities.

After difficult labour, the cartilages of the pelvic synchondroses are liable to inflammation, in consequence of the traction exerted upon them, and if the blood has assumed a septic constitution, the inflammation may terminate in gangrenous fusion of the cartilage, the latter being converted into a dirty brown and very much discoloured fluid, contained within the investing ligamentous tissue.

The blood contained in the cavities and larger vessels presents various, and more or less evident, changes. Its fibrine may be converted into consistent, viscid, greenish-white, or yellowish coagula; or after previous extensive discharges of fibrine it may be attenuated, watery, exuding through the coats of the vessels and the adjoining tissues, and presenting but few and trifling, gelatinous, soft coagula. Again, after previous purulent or sanious absorption, it is of a dirty brown-red or chocolate colour, viscid, glutinous, depositing dirty white, opaque, fibrinous concretions, which in the heart form numerous ramifications, or presenting dark red coagula, which are paler at the surface, and fusible. Lastly, if the disease has run a rapid course, the blood is much reduced in quantity, and even without defibrination having taken place, it is attenuated and discoloured, and transudes all the tissues. The fibrine is sometimes found deposited on the valves of the heart in the shape of vegetations, without the demonstrable occurrence of previous pericarditis. The severe jaundice affecting women during the puerperal state is always dependent upon pyæmia, and never upon an appreciable derangement of the liver.

The formation of bone occasionally noticed on the external and internal table of the skull after parturition is, as we have already observed, in no connexion whatever with the puerperal process.

6. *Termination and consequences of the puerperal processes.*—We confine ourselves at present to an account of those terminations and consequences of the fundamental puerperal processes, which are not to be inferred from the previous remarks.

Puerperal peritonitis generally terminates in the same manner as ordinary peritonitis; we notice as particularly important the unfavorable terminations in suppuration—phthisis—of the peritoneum and the adjoining tissues (ulcerative perforations of the diaphragm, the abdominal parietes, the intestines, the bladder, the vagina, &c.), and in peritoneal tuberculosis. The exudations upon the internal sexual organs may become converted into cellular tissue, and by fixing the tubes in an unfavorable position, even without occlusion of the fimbriated extremity, cause sterility.

The exudative processes occurring on the internal surface of the uterus, as well as the exudation in the uterine parenchyma accompanying the former and metrophlebitis, not unfrequently degenerate into suppuration of the uterus, and the consequent purulent and sanious abscesses, extending chiefly from the point of insertion of the placenta in various directions, may discharge themselves into the peritoneal cavity. The affection generally runs its course as acute uterine phthisis.

A very remarkable and important result of the exudative processes on the internal surface of the uterus is tabes of the uterus, which is manifested by extreme brittleness and friability of the uterine fibre. The uterus very rarely attains such a degree of involution as to resume the size of the unimpregnated organ; it generally remains considerably enlarged, of the size of a duck's egg or a man's fist; its tissue at the same time is porous, of a pale red, and at some parts of a slate colour; the insertion of the placenta continues visible, by the relaxation of the tissue and the irregularity of the inner surface, or the mucous membrane is at this place invested by a yellow or yellowish-white ashy substance, the remains of the exudation, and generally presents a retiform appearance.

Metrophlebitis, by the suppuration of the coats of the veins, gives rise to the formation of abscesses in the uterine parenchyma, which not unfrequently anastomose at various points, and thus form branched sinuses. The disease is very persistent if the uterus passes into a state of marasmus, and if it maintains dirty brown hemorrhagic and fetid exudations on the internal surface of the uterus.

SECT. III.—ABNORMITIES OF THE FALLOPIAN TUBES.

§ 1. *Defect.*—The tube may be absent on either side if there is a corresponding defect of one half of the uterus, but this certainly is not always the case, inasmuch as it is not only often present when there is not even a trace of a uterine rudiment, but as it may exist in the shape of a solitary coiled tubercle even when the ovary is wanting.

In many cases the fallopian tube may be imperfectly developed, its coats thin, its parenchyma impoverished, and its passage narrowed; or, the uterus being normal, it may merely appear as an excrescence of the former, terminating blindly above the uterine horn, or it may be inserted either at its normal place, or elsewhere, without presenting an open channel.

When a fallopian tube is absent, the peritoneum occasionally presents a fringed process, in imitation of the morsus diaboli.

§ 2. *Anomalies of Caliber.*—These consist in dilatation or contraction of the fallopian tube; in the latter case obliteration may result.

The former is very commonly the consequence of a catarrh of the tube, owing to retention of the mucous secretion from contraction, obliteration, or obturation of the orifices; it may degenerate into dropsy of the tube, an affection of which we shall say more at a future period.

The latter consists—independent of the natural contraction of the tube in the decline of life—chiefly in a diminution of the passages by tumefaction of the mucous membrane, or in obstruction of the same by mucus. The contraction may pass into complete closure or obliteration of the tubes; it chiefly affects the uterine orifice in consequence of catarrh; the fimbriated extremity is often closed up by cellular formations, or organized peritoneal exudation (atresia tubæ). The imperforate condition of the fallopian tubes is of importance in regard to sterility.

§ 3. *Anomalies of Position and Direction.*—Under this head we reckon the very unusual congenital irregularities in the entrance of the tube into the uterus, whether communicating with the cavity of the latter, or terminating in its tissue blindly.

Among the acquired abnormities the deflections and curvatures of the tubes become the more important, the more the unattached end of the tube is turned away from the ovary and fixed in its abnormal position by the products of peritoneal inflammation. It is found variously agglutinated to the neighbouring tissues, and is particularly apt to become reverted upon and fixed to the posterior surface of the broad ligament, the ovary and the uterus.

In consequence of chronic catarrh, or tubercular disease of its mucous membrane, accompanied by hypertrophy or thickening of its parietes, the fallopian tube is apt to assume a serpentine tortuous course. Or if the ovary enlarges, it may be extended to an unusual length, and its coats thinned; and if it happens to wind round the former, it is much stretched.

The tube has, like the ovary, occasionally been found in the abdominal ring, within an inguinal hernia.

§ 4. *Diseases of the Tissues.*

1. *Hyperæmia, hemorrhage.*—Hyperæmia of the fallopian tube is almost always a symptom of general congestion of the sexual organs, and especially of the uterus. In rare cases, however, the hyperæmia of the tube predominates, and may lead to hemorrhage of the tube, in which case a larger or smaller quantity of blood is effused into the cavity of the peritoneum.

We have twice had occasion to observe the occurrence of such hemorrhage in the course of abdominal typhus; the left tube was distended, its mucous membrane of a purple tint, and congested. We have once seen it in the body of a female who was attacked, three days previous to her confinement, with pleuritis and hepatitis, and in the fourth instance it was associated with retroversion of the uterus. Barlow has met with this condition in purpura, in consequence of or connected with abortion; and Brodie has observed it in a case of retention of menses in the uterus, owing to occlusion.

2. *Inflammation. a. Catarrhal inflammation.* — Chronic catarrh, or blennorrhœa of the fallopian tube, is a very common disease; it is frequently a residue of a puerperal affection of the mucous membrane of the tube; or the catarrh may have extended from the vagina and uterus to this point, and is coexistent with vaginal and uterine catarrh, or persists after the cessation of the latter.

At the same time the tube is variously dilated, its course tortuous, its coats thickened; the mucous membrane is tumefied, purple, slate-coloured, or of a blackish-blue tint; the passage contains a viscid, transparent, milky-white or creamy, or a bluish-gray, or yellow, purulent mucus.

Catarrh of the fallopian tube, by spreading to the fimbriated extremity, gives rise to peritoneal inflammation in the vicinity of the orifice, and thus the free termination may become adherent to the neighbouring tissues and be closed up, whilst the uterine orifice is obstructed and occluded by the catarrhal tumefaction of the mucous membrane. Catarrhal inflammation in this manner induces sterility.

The chief seat of catarrh is the external distended portion of the channel, and it is here that we find the greatest accumulation of blennorrhoic secretion.

Under the above-mentioned condition, viz. occlusion of the orifices, catarrh of the tube is very often converted into dropsy of the tube, a condition similar to that which we have already become acquainted with in various other mucous channels and cavities. In consequence of the accumulation of secretion from obstruction of the orifices, the tube, especially towards its fimbriated extremity, becomes so much distended, that that which before represented a tortuous or bent channel, is now converted into a simple sac. At other times, several saccular dilatations form between the separate angles and the projecting duplicatures of the tubal parietes, and give rise to an imperfectly loculated pouch, which, as in the former case, may contain blennorrhoic mucus, a puriform secretion, a true purulent inflammatory product, or, if the mucous membrane has become altered, fluids of another description. It is to be observed, that as the dilatation proceeds, the texture of the mucous membrane is changed, and the latter is converted into a serous membrane; its secretion may be a thin, watery, serous, or albuminous synovioid, colourless liquid, giving the tube the appearance of a transparent sero-fibrous bladder; or it may be variously coloured, yellowish, brown, blackish-green, chocolate-coloured, inky, and more thick and flocculent, consisting in part of inflammatory products on the internal surface of the membrane.

The hydropic fallopian tube not unfrequently attains the size of a duck's or goose's egg, or even of a man's fist; although not a usual occurrence, still it is satisfactorily proved that the contents are sometimes discharged into the uterus, and thus carried off.

In extremely rare instances chronic catarrh of the fallopian tube becomes acute, and passes into suppuration; its contents may then be either poured into a cavity of the peritoneum, which has been circumscribed by adhesive inflammation, or into the perforated intestine, which has been previously agglutinated to the tube.

b. Exudative processes.—An exudative process scarcely occurs on the mucous membrane of the fallopian tube except in combination with a similar condition of the internal uterine surface after childbirth. The tubes are tumefied and infiltrated; their mucous membrane is variously reddened, discoloured, excoriated, softened, and everted at the fimbriated extremity; the passage of the tube is dilated, especially at its outer end, and filled with various products, purulent and sanious fluids, and in uterine croup with coagulable lymph, assuming the shape of a tubular concretion. The exudative process has extended from the uterus to the tube.

3. *Adventitious growths. a. Cysts.*—Serous cysts are very often formed at the fimbriated extremity of the tubes, and in its vicinity; and they are generally attached by a pedicle, which sometimes attains a considerable length. They scarcely ever become larger than a bean or hazel-nut.

b. Fibroid tumours.—These are not frequent; they are rarely larger than a pea, and occupy the parenchyma of the tube in the shape of round or discoid tumours.

c. Tubercle.—Tubercle of the fallopian tubes (fallopian mucous membrane) is generally associated with uterine tubercle; but it is remarkable that it sometimes occurs independently of the latter, or in a condition of higher development. It therefore follows that in many cases of tubercular affection of the internal sexual organs, the mucous membrane of the fallopian tube is the primary seat of disease.

Tubercle of the tube is almost always presented to us in the dead subject, in the shape of tubercular infiltration and complete disorganization of the mucous membrane; the latter being converted into a softened purulent layer of yellowish-white, cheesy, lardaceous matter, which is cracked and friable, and chokes up the passage. The tube is more or less swollen, its course tortuous, it is hard to the touch, and its parenchymatous coat thickened, and converted into a dense lardaceous tissue. The fimbriated extremity presents a very peculiar appearance; the mucous membrane, which is infiltrated with tubercular matter, being pushed out in the shape of a cauliflower excrescence, and everted upon the peritoneum.

Opportunities are very rarely afforded of observing the disease at its commencement, which occurs in the shape of a deposit of crude, gray, discrete, or agglomerated tubercular granulations. In the above-described shape, it must doubtless be viewed as the result of a tumultuous localization of the general disease, occurring under symptoms of congestive inflammation. The remarks made in reference to uterine tubercle apply to this affection.

d. Carcinoma.—Except when involved in cancer of the peritoneum, the tube is not affected by this disease; and even an extension from the uterus or other adjoining tissues by mere contiguity, after pseudo-membranous attachments have been effected, is very rare. Still I have noticed one case of ovarian cancer, in which the tubes, without being agglutinated to the former, were thoroughly diseased; the parietes were very much thickened, callous, contracted in their long diameter, and curled up.

SECTION IV.—ABNORMITIES OF THE OVARIES.

§ 1. *Defect of Formation.*—It is very unusual for one of the ovaries to be wanting, if the sexual apparatus is otherwise normal.

The ovaries often appear, together with the other portions of the sexual organs, in a state of imperfect development, and small; and, on account of the depth at which the graafian follicles are placed, of uniform density and hardness, and with an even and smooth surface.

§ 2. *Deviations of Size.*—We find various enlargements occurring in the ovaries, which form a contrast with the just-mentioned smallness of the ovaries and their diminution at the decline of life; the latter affection only comes within the domains of pathology if it occurs prematurely. We shall have occasion to notice them all under the head of textural disease, and therefore do not here enter into a more minute examination of the subject. We here merely allude to that form of ovarian dropsy which results from the excessive development or hypertrophy of one or more graafian vesicles, as a subject coming under the above denomination; but it will be more practical to consider it fully when we speak of the formation of ovarian cysts.

§ 3. *Diseases of the Tissues.*—These diseases affect either the cellulo-fibrous substance (stroma) and the fibrous capsule of the ovary, or the follicles, or both together, as we shall have occasion to explain in the subsequent sections that relate more particularly to this point. We confine ourselves to the most important and conspicuous affections of the follicles and their contents.

1. *Hyperæmia, Apoplexy.*—Hyperæmia of the ovary, affecting both its stroma and the external layer of the follicle, occurs physiologically in menstruation; but it also accompanies numerous pathological processes in the sexual apparatus, and is sometimes permanent. Its characters are tumefaction of the ovary, softening of its tissue, vascularity, and darker colour; permanent hyperæmia gives rise to a gradual increase of size, to hypertrophy of the stroma, and enlargement of the ovary.

Hyperæmia affecting the more developed follicles that are seated at the surface of the ovary often induces effusion of blood into the cavity of the follicle or apoplexy. One or more cysts, varying in size from a pea to a hazel-nut, are found in the ovary; they project more or less above its surface, after having perforated the fibrous sheath of the ovary, and are at once recognised by their contents being visible through the parietes of the follicle. If seen shortly after the occurrence of extravasation, they are tense; but more commonly a certain amount of coagulation has been effected in their contents, and they then appear slightly collapsed, and present fluctuation. They now contain a dark red loose coagulum, which is invested by a white or coloured fibrinous coagulum varying in thickness. In the course of time the coagulum assumes a rusty or yellow colour, is converted into a pulp which gradually becomes inspissated, and yields the above-mentioned fibrinous coagulum and serosity, the latter being in its turn removed by exosmose and absorption. The entire cyst contracts, retaining traces of the original lining coagulum of fibrine and of its yellow deposit, and, perhaps, also a yellow, indurated, friable, chalky residue of the coagulated blood; it may become reduced to less than the normal size of the follicle, and from drawing in the fibrous sheath of the ovary, cause the appearance of a cicatrix. The contents and parietes of the apoplectic cyst consequently present an appearance which varies according to the length of time that has elapsed. We very often find cysts of different dates in one or both ovaries.

It is evident that this effusion of blood must induce a destruction of the germ, and, at last, cause an entire obliteration of the follicle. The cicatrix naturally always presents a greater or less resemblance to the corpus luteum. Although the amount of effusion is often very considerable, rupture of the follicle and hemorrhage into the peritoneal cavity is of very rare occurrence.

The most common cause of this affection is excessive menstrual congestion, and it undoubtedly comes within the sphere of pathological inquiry. (Vide Negrier.)

2. *Inflammation.*—Inflammation occurring in the ovary, independently of the puerperal state, is limited to the follicles. The coats of a follicle are occasionally found injected, reddened and softened, and friable; the contents are opaque, flocculent, reddened by an admixture of blood, and not unfrequently purulent. Each of these processes, even in its slightest form, is followed by a destruction of the germ by means of the exudation; obliteration of the follicle soon ensues, and the first impulse is thus given to its conversion into a common serous cyst, which in its turn may grow into ovarian dropsy.

On the other hand, inflammation resulting from childbirth, puerperal inflammation, involves the entire ovary, though probably in the first instance the stroma only; it is this that generally gives rise to the suppuration and abscess of the ovary noticed by ancient and modern observers. It not only varies much in intensity, but, like the other puerperal processes, in kind also; this is particularly evidenced by the product and the state of the tissues. According to the manner in which it is complicated with other puerperal affections, it plays the chief, or only a secondary part, as will become apparent from the following remarks.

The ovary may be swollen to the size of a hen's, duck's, or goose's egg, presenting various discolorations, and being at the same time collapsed and pulpy, its tissue distended by a dirty yellowish-brown, brownish-green, chocolate-coloured fluid, or converted into a fetid pulp; this is putrescence of the ovary.

Or the ovary may present a pale greenish, or yellowish, or reddish gelatinous viscid product, which is deposited in the stroma in large quantities; the latter being at the same time friable or semi-fluid, the follicles tumid, their coats swollen, and their contents opaque and flocculent. The ovary is at the same time enlarged and tense, as in the former case.

Again, the deposit may be serous (of a pale yellow or reddish colour) or fibrinous (of a yellowish-white colour), and fusible; filling the tissues, and causing the follicles to present an opaque appearance. The tissue of the ovary and the coats of the follicles are congested and more or less reddened, and both are softened and friable.

Again, the congested stroma of a moderately tumefied ovary may be infiltrated with a flocculent serosity, which is rendered opaque by plastic exudation.

In all these cases the parenchyma of the ovary is more or less ecchymosed; its sheath presents exudations of various kinds, under which differently-coloured, spotted, or striated suffusions are found; the tissue at the same time being softened, and extremely friable.

These are the chief varieties and degrees of puerperal inflammation of the ovaries; they enter into complications with other puerperal processes, and especially with endometritis and peritonitis, and give rise to the same products; they differ, however, in intensity, and the inflammation of the ovary may either be the predominating disease, or, as is commonly the case, the subordinate or partial symptom of an extensive exudative process of the uterine or tubal mucous membrane of the tissue of the uterus, or the adjoining accumulations of cellular tissue or of the peritoneum.

We have, lastly, to allude to the condition presented by the ovaries in puerperal exudative disease, when they are not themselves involved in the latter process; like the other tissues in the vicinity of the seat of disease, they are infiltrated with serum, softened, flabby, pale, and friable.

Exudative processes either affect one, or, more frequently, both ovaries at the same time, though generally not in the same degree. They may run a very rapid course, sometimes even assuming such violence as to induce a spontaneous rupture of the ovary; they prove fatal by the intensity of the general disease; or by the exudative processes with which they are complicated; or they may terminate, after a slower progress, in suppuration (phthisis) of the ovary. In the case of recovery, sterility is entailed upon the affected ovary, in consequence of destruction of the germs and obliteration of the follicles.

Suppuration either commences at separate points which gradually coalesce, or it is set up equally throughout. The parenchyma of the ovary is by degrees consumed, and the organ converted into a purulent cyst, which sometimes attains a very considerable size.

The abscess itself is sometimes borne for a long time without marked symptoms, and nature does her utmost to prevent a free discharge of it into the peritoneal cavity; for adhesions are formed between the ovary and the adjoining viscera, either in consequence of peritonitis having been combined with the inflammation of the ovary, or from circumscribed inflammations of the peritoneum having been set up in the course of the ovarian disease. Thus the ovary may become agglutinated to the broad ligaments, to the pelvic parietes, the uterus, the bladder, or the rectum and the sigmoid flexure, to the cæcum and the vermiform process, and the small intestine; and it is generally attached to several of these viscera at the same time. When at last the suppurative process has eaten away the fibro-serous investment of the ovary, and caused its rupture, the discharge follows, from a yielding of the adhesions, into a circumscribed cavity; new partial inflammatory attacks of the peritoneum ensue, or the pus meets with an organ which presents firm attachments. In the former case, the circumscribed processes not unfrequently pass into universal peritonitis, or this is induced by an extravasation of the pus through the relaxed adhesions. Again, in either of these cases, the suppuration may extend to the adjoining viscera, and the contents of the abscess be discharged outwards, indirectly through a circumscribed peritoneal sac, or directly in the hypogastric or umbilical regions; or into a portion of the intestine, into the bladder or vagina. Suppuration occasionally takes place in the pelvic cellular tissue investing the iliac muscle; such abscesses pass through the femoral ring or through the ischiatic notch, and accordingly make their appearance on the thigh or the nates. They may thus discharge themselves at a considerable distance from the original nidus.

3. *Morbid growths. a. Cysts.*—In no part of the body are cysts so frequent, or so various as in the ovary, in the peritoneum, in the neighbourhood of the internal sexual organs, or in the subperitoneal cellular tissue; as, for instance, between the laminæ of the broad ligaments, and at the fimbriated extremities of the tubes. Moreover, the size attained by the ovarian cysts is extraordinary. It is more practical to consider all the different cysts at this place, though we shall parenthetically indicate the position they occupy in morbid anatomy, and have to revert to them in the sequel. At the bedside the term ovarian dropsy is equally applied to all cysts, provided they fluctuate. We commence with the simple formations, and pass on to those which, in reference to original development, structure, growth, pathological importance, and contents, are more complicated.

a. Simple cysts.—They are of very common occurrence. There are either one or several unilocular cysts in the ovary; at times they are even so numerous, that the ovary appears converted into an aggregation of cysts. They are placed near one another, each one being formed from the stroma, independently of the others, and they have a rounded form. If they enlarge, they come into mutual contact, their parietes adhere to one another, and they are flattened by reciprocal pressure; the impression may thus arise that several have, in the manner of the compound cysts, been formed within the parietes of the same matrix. They attain a considerable size, rarely, however, exceeding that of a man's head. In this case the solitary cyst, or one of several cysts, undergoes extreme development, whilst the remainder continue undeveloped. They generally have delicate sero-fibrous parietes, and may contain a colourless, or pale yellowish or greenish serous, or a more consistent yellow, brownish, colloid substance, or an opaque chocolate-coloured or inky fluid. In many cases they are undoubtedly formed from the graafian follicles; and it appears that an inflammatory process is particularly liable to give the first impulse to this metamorphosis. They are probably, however, as often new formations from the beginning; and this is the more likely in those cases in which their number exceeds the average number of graafian follicles. Allied to them are the adipose cysts of the ovaries: these we shall, however, discuss at a later period, on account of their numerous peculiarities.

β. *Compound cysts.*—They occur in the two forms described by Hodgkin. In the one, new cysts are formed in the coats of an older cyst, and although projecting into the cavity of the latter, they do not actually grow into it; the oftener this process is repeated, the more complicated the morbid product becomes. In the other, an endogenous generation of cysts is effected, cysts being formed upon the internal surface of another cyst, and being either sessile or pediculated; the matrix is sometimes entirely filled, the cysts discharge themselves into it and become adherent to it, and subsequently a third order of cysts may be formed within them, &c. The two forms are often seen in the same adventitious growth.

These cysts are capable of very extensive development; to them and to the following variety the large encysted ovarian dropsies are due. The separate cells or loculi contain the above-mentioned different substances, and their parietes, especially those of older cysts, are generally of considerable thickness, and of dense texture. They, too, may probably in the first instance be developed from a graafian vesicle as simple cysts, or they may form as adventitious growths; the remaining substance of the ovary is spread out at the base of the cyst; it is, as it were, thrown open, and its tissue condensed.

γ. A third form, which very much resembles, and is closely allied to, the last, is of a cancerous nature, and belongs to the areolar variety of carcinoma. In the shape which we are about to describe, it rarely occurs anywhere but in the ovary. It is an accumulation of numerous fibrous sacs, which contain various substances, but for the most part a glutinous, viscid matter. They diminish in size from the circumference towards the interior, and especially towards the base of the morbid growth; so that the latter represents a condensed alveolar mass, the alveoli or follicles of which consist of a white, shining, fibrous tissue, and contain a colourless or grayish, yellowish, yellowish-green, or reddish viscid gelatine. We have here an areolar cancer, the peripheral follicles of which are converted into large sacs. This species of ovarian dropsy, which, for the sake of distinction from the other varieties, we term alveolar dropsy, is proved to be malignant, not only by its being accompanied by well-marked cachexia, but also by its complication with cancer (especially of the medullary variety) in the same organ, and with other varieties of cancer in other organs, as the peritoneum, or the stomach, and moreover by its complication with mollities ossium.

As already remarked, it attains an enormous size, and like the composite cysts, occasionally exists in both ovaries at the same time. In the composite as in the alveolar cyst, one peripheral follicle is subject to preponderating growth, and establishes ovarian dropsy.

To the above special observations we add the following remarks as important for the diagnosis. Generally but one ovary is affected, though the two are often attacked successively, so that the increase of size is much more considerable in one than in the other.

The enlarged ovary remains within the pelvis as long as it does not exceed certain dimensions; it either continues freely moveable between the uterus and its lateral appendages and the rectum, or becomes fixed, and, as it were, wedged in by the formation of false membrane. If it increases still further, and is adherent to the pelvis, it grows into the abdominal cavity; otherwise it leaves its previous position, and rises into the abdomen, where it continues moveable, until, in consequence of peritoneal inflammation, it has formed adhesions with adjoining viscera, or becomes fixed by entirely filling out the cavity. In the course of this change of position, it drags the uterus after it by means of its ligament, so that this organ, together with the vagina, is not only elongated, but obtains a slanting form, which is recognisable by the oblique and elevated position of the os tincæ. (Page 282 and 284.)

If both ovaries are involved in the disease, inasmuch as they are generally affected successively, and one is less enlarged than the other, the smaller one remains in the pelvis, and its retention is proportionate to the obstacles offered to its ascent by its fellow. It is wedged in between the uterus and the rectum, even if there are no adhesions. If we find the above-mentioned irregularity in the uterus and the vagina, and at the same time discover an immoveable tumour in the pelvis, which weighs upon the posterior walls of the vagina, and pushes it, together with the uterus, forwards, it may be assumed, if there are no contraindications, that both ovaries are diseased.

The cysts very frequently become the seat of inflammation. This either attacks at different periods the peritoneum, investing the diseased ovary, and causes its adhesions and fixation in the abdominal cavity, or the fibro-serous parietes of the cysts themselves inflame, and the resulting products are deposited upon their internal surface or in their cavity. Thus we find not only all the exudations with their metamorphoses, that occur on the normal serous membranes, at this place, but also all the further effects of this variety of inflammation. Our observations, however, lead us to except the tubercular metamorphosis of the inflammatory product; we, at least, have never met with it, in spite of very extensive and various opportunities.

As the dropsical ovary enlarges, it occupies more and more of the abdominal cavity; it distends the belly to an enormous extent, pushes the intestine into the inguinal regions, forces the epigastric viscera, together with the diaphragm, into the thorax, and causes universal emaciation, proportionate to the increase of the tumour. The adventitious growth enters into combination with fibroid and carcinomatous products, and especially with medullary cancer, in the manner which we shall have occasion to explain further on. It is the less frequently complicated with tubercle, the more it approaches the character of areolar cancer, and the more it compresses the thorax by its increase of size.

There are a few cases on record in which the dropsical ovary is said to have discharged its contents into the fallopian tube, and thus into the uterus, and externally.

δ. The simple cyst, or the cyst with secondary endogenous formations, also occurs in the shape of cystosarcoma of the ovary; this, however, is much rarer than any of the above-mentioned three varieties, and scarcely ever attains the extreme size to which these are developed.

ε. Finally, we observe that cysts with anomalous contents, viz. encysted fatty tumours, occur nowhere so frequently as in the ovary; either, and most commonly, as a simple cyst, or as the composite cyst, in which one of the cysts of the secondary formation is distinguished from the rest by its adipose contents, or, though rarely, in the shape of a compound adipose cyst. We often find the fat associated with a formation of hair, frequently, too, of teeth, and sometimes with the formation of bone. Like the serous cysts, the adipose cysts are undoubtedly often formed from a graafian vesicle; they occur most frequently in the prime of life, rarely at the period of puberty, and still less frequently in childhood. We have, however, one case of adipose cyst of the ovary in the museum of Vienna, belonging to a child of six years. They grow very slowly, and rarely exceed the size of a child's head. There generally is but one adipose cyst in one of the ovaries; the two are rarely affected at the same time.

The inflammation to which this variety is equally subject with the other cysts, gives rise to a dilatation of the cyst, as well as to an essential alteration in its contents by means of the exudation. It occasionally terminates in suppuration, and discharge of the contents externally at the navel, in the hypogastric, or inguinal regions; the contents consist chiefly of pus mixed up with hairs. Under certain circumstances, which will be explained in the sequel, the partially liquefied contents of an adipose cyst assume a peculiar form. In a female, 46 years of age, who died of internal hernia, the right ovary was found converted into an ellipsoid fibrous sac, of the size of a man's head, and nine inches in its long diameter; it had mounted above the pelvis, and lay obliquely in the left iliac fossa. Its inferior apex was attached to the ovarian ligament; the other, which was directed upwards and outwards, was attached to the anterior surface of the middle portion of the jejunum, by means of a cellular band of an inch in breadth. The sac had been twice turned upon its axis; it contained a brown, fatty, gelatinous fluid, in which, besides a ball of the size of a walnut, composed of hairs that were matted together, there floated seventy-two bodies of the size of a filbert, and a much larger number of smaller bodies of the size of a pea, consisting of a greasy fat. They were of a yellowish colour, and from mutual pressure had a polyhedral surface, and presented concentric layers. The cyst was not only surrounded by coils of the small intestine, but two portions of intestine also passed underneath it. It may therefore be said to have represented a capsule, which both from its form and attachment, and from the circumstance of its having been found rotated upon its axis, resembled a dredging-box (granulirbüchse), the rotations of which had converted the contained fat into the globular bodies above described.

b. Anomalous production of fibrous and osseous tissue.

a. Fibrous tissue is formed—

In the shape of fibroid exudation on the internal surface of the simple cysts, but more especially on that of the composite and areolar cysts;

As a subperitoneal (subserous) new growth (so-called cartilaginescence) in the cystic parietes;

As a fibroid tumour: this rarely attains a larger size than that of a hemp seed or pea. We must except those cases in which the tumour has formed in the parietes of a compound cyst;

As a dirty white or yellow, plicated, curled, soft concretion, within which, not unfrequently a cavity may be traced. These concretions appear to be graafian follicles which, after having undergone inflammatory thickening, shrivel up and become obliterated: after puerperal processes we find them occasionally in the shape of soft, collapsed, friable sacculi, whilst under other circumstances they appear as solid, dense coriaceous cysts;

As a cicatrix, presenting a rounded, nodulated wheal, with a yellow, rusty or black nucleus, resulting from follicular apoplexy of the ovary.

β. A formation of bone occurs—

In the shape of so-called ossification (earthy concretion) in the majority of the just mentioned fibroid growths, and more particularly in the fibroid exudation, and in the subserous fibroid formations of the dropsical ovary;

As genuine bone, in various forms that offer but a weak analogy to one another, and in the adipose cysts.

c. Tubercle.—The occurrence of tubercle in the ovaries is at least doubtful; so far as our own investigations and observations go, we must deny it altogether.

d. Carcinoma.—Cancer, on the other hand, if we collect all that comes under this denomination, is not unusual.

a. The most frequent form is areolar cancer in the above described shape of areolar hydrops ovarii; the conversion of the peripheral follicles of the ovary into large sacs, is a peculiarity which but rarely presents itself in other tissues. We have already alluded to all the important points connected with this subject.

β. Medullary carcinoma is less frequent than the former. There are two varieties. The first occurs in the shape of rounded adventitious growths, varying in size from a goose's egg, to a child's head, and invested with a fibrous sheath; it sometimes perforates the latter, and grows freely into the peritoneal cavity. In the interior we occasionally find large masses of cellular tissue traversing the substance of the tumours in the shape of septa, and inducing considerable density of the mass; at other times the entire ovary appears infiltrated with soft encephaloid matter, so as to present fluctuation. The carcinomatous matter is either genuine white cancer, or it contains pigment-cells, which vary in arrangement and number; in the latter case it is brown or black, spotted or striated, or black throughout (cancer melanodes). It occasionally is combined with the formation of cysts, the latter being either developed on the free surface of the peritoneal sheath of the ovary, or underneath the latter, and in the peripheral layers of the stroma.

This variety occurs in complication with peritoneal cancer, with uterine, mammary and ventricular cancer, with cancer of the lymphatic glands and the rectum, and universal cancerous deposit. Close adhesions are sometimes formed between it and the adjoining cancerous rectum, so that there is often considerable difficulty in ascertaining which of the two organs is the primary seat of disease. Both ovaries are very often affected.

In the second variety, racemose, fimbriated, fibrous, vascular excrescences, containing a milky or creamy juice, or an encephaloid pulpy mass, form on the internal surface of the peripheral follicles of areolar cancer, or of one of the sacs of the compound cysts, or even upon the internal surface of a small primary cyst. They are often very numerous, and attain a considerable length; they become condensed into large masses, and after perforating the parietes of the cyst, sprout through it.

This form is often, though not invariably, coexistent with areolar cancer of the ovary or of other organs.

γ. Fibrous cancer (scirrhus) occurs very rarely in the ovary.

SECT. V.—ABNORMITIES OF THE MAMMARY GLANDS.

§ 1. *Arrest and Excess of Formation.*—Froriep has lately recorded an extremely rare case of absence of one of the mammary glands in a female; the muscles and bones of the corresponding or right side of the thorax were imperfectly developed. The mammæ are found imperfectly developed in those cases in which the sexual apparatus generally is defective, and where certain parts of the latter, or the entire individual, present an hermaphroditic appearance, approaching the male type. An excess of development occurs in various degrees and forms: in the first instance we find an increase in the number of nipples, one gland being provided with two or three; or there may be supernumerary glands, a third one being placed under one of the normal or between the two breasts. Sometimes the accessory gland is situated externally in the armpit, or there may even be a third, fourth, and fifth, which are arranged symmetrically under the normal breasts, and are always smaller than the latter. We include under this head also, the precocious development of the mammæ in premature puberty, as well as the development occasionally found in the mammæ of man approaching the female character, either with or without an arrest of development in the genital organs. An excess of development is occasionally simulated by the gland being separated into several lobes.

§ 2. *Anomalies of Size.*—In addition to the anomalies spoken of at the end of the preceding section, we here allude to the increase in the size of one or, more commonly, of both breasts, developed spontaneously or after sexual excitement in either sex, or in the female sex after parturition. It consists in an hypertrophy of the gland and of the surrounding fat. The enlargement may attain a most extravagant extent, so as even to overwhelm the powers of growth in other parts. Hypertrophy of the gland is very often introduced by violent congestion, and accompanied by a secretion of milk.

A diminution or atrophy of the gland, as a morbid process, occurs in the shape of premature involution, both in consequence of the effects of over-nursing, as well as from the sexual functions being completely in abeyance.

§ 3. *Diseases of Tissue.*

1. *Inflammation.*—Inflammation of the mammary gland occurs very rarely, except in consequence of various causes that operate during the puerperal state, and during suckling.

The gland is never attacked throughout, but the inflammation appears at distinct spots of various dimensions, or is, as it were, reduced to them in the course of its progress; and whilst it is here developed with greater intensity, becomes moderated and recedes at all other points. Its symptoms are, besides tumefaction of the gland at the seat of disease, congestion and reddening, by which the natural appearance of the gland is obliterated, and made to resemble flesh: there is also hardness and resistance, with increased density of the parenchyma, which has lost its toughness, and has become friable and lacerable. The gland is infiltrated with a coagulable product, containing more or less reddish serum. Cure may ensue by resolution or absorption of the product, or the process may pass into more or less considerable induration, which at times is very obstinate, or, again, it may terminate in suppuration or abscess of the gland.

Inflammation of the mammary gland not unfrequently coexists with one of the above-described puerperal diseases, though there is no essential relation between the two affections. The resulting abscess is to be carefully distinguished from the deposition of pus, consequent upon its absorption in metrophlebitis.

2. *Cirrhosis of the mammary gland.*—There is a certain condition of the breast which, from all that we know of it, seems comparable to cirrhosis of the liver and the lungs (bronchial dilatation). We have been unable to ascertain whether any particular disease gives rise to it, but there is every reason to suppose that it is the result of protracted suckling.

3. *Adventitious growths.*—A great variety of adventitious growths occur in the mammary gland; some of these are unusual, whilst others are very frequent. They affect mainly the female breast, and only exceptionally, and from very remarkable influences, the male breast.

a. Cysts.—The simple cyst, with serous, albuminous, or colloid contents, as well as the adipose cyst, with or without the formation of hair, is very uncommon; the compound cyst is equally rare. Not so, however,

b. Sarcoma.—This is of common occurrence, and it often assumes the shape of encysted sarcoma, the cysts being either simple, or presenting the endogenous development of secondary cysts; this form is the hydatid tumour or hydatid mammary carcinoma of English writers. All the sarcomatous growths are liable to attain a considerable size, they are frequently recognised as such, and may be extirpated successfully.

c. Fibroid tumours and enchondroma.—These are not frequent; we have observed the former a few times, but only of small dimensions. Johann Müller has seen one instance of the latter.

d. Tubercle.—According to our own observations, tubercle never occurs in the mammary gland.

e. Cancer.—Cancer, on the other hand, which is found to occur in almost all its varieties, is the more frequent; mammary and uterine cancer alone suffice to give to the female sex a vast preponderance over the male sex, as to the frequency of cancerous affections. The different forms may occur by themselves, or in combination with one another; medullary carcinoma is particularly liable to form upon a scirrhous matrix.

α. True scirrhus, or fibrous cancer, and the following variety, are the most common. Scirrhus presents the well-known characters of a cartilaginoid, immoveable nodulated, branched tumour, which draws in the integument, and more particularly the nipple, with its areola, and is imbedded in fat. Its internal structure presents a lobulated appearance, and consists of a whitish fibrous stroma, and of a gray transparent crystalline substance, which is deposited in the interstices of the former. It is often traversed by lacteal ducts which contain a corrugated, whitish, or yellow cheesy matter. The ulcer that it gives rise to is cup-shaped, and presents a hard elevated margin and a sanious discharge; extends in all directions, but especially backwards, so as to involve the pectoral and intercostal muscles, the periosteum of the ribs and their bony structure, and at last to fix itself immoveably in the thoracic parietes. The margin as well as the base of the ulcer degenerate into a red, vascular, bleeding fungus, which is distended by a whitish encephaloid juice; the immediate consequence is a development of lardaceo-medullary tumours in the most various tissues, either in the vicinity or at a distance. This constitutes—

β. Medullary carcinoma, which however occurs not only in combination with fibrous carcinoma, but also in a primary form; in the latter case it is equally distinguished by its rapid growth, its large dimensions, by the much more speedy degeneration into universal cancerous cachexia, and by the sponginess of the ulcer.

γ. Cancer hyalinus is much less frequent than either of the former varieties; it occasionally attains a considerable size, and has, in addition to other peculiarities, a remarkably lobulated structure.

Cancer of the mammary gland is generally developed after the thirty-fifth, though it is sometimes met with before the thirtieth year. It frequently exists by itself, but is more commonly combined with cancer of the adjoining axillary glands, with mediastinal, pleuritic, pulmonic, uterine, hepatic, and cerebral cancer, with universal cancerous cachexia, and with mollities ossium.

SECT. VI.—ABNORMITIES OF THE OVUM.

We shall first discuss the anomalies presented in the attachments of the ovum, i. e. its attachment and development at a point external to the uterine cavity, extra-uterine pregnancy and the degeneration of the ovum. We shall then examine the abnormities occurring in the separate parts of the ovum, the membranes, the placenta, the funiculus umbilicalis, and the fœtus.

§ 1. *Extra-uterine Pregnancy.*—Extra-uterine pregnancy may take place at different points; in the order of frequency these points are, the fallopian tube, the parietes of the uterus, the ovary, and the vagina. We proceed to state the more important matters connected with each of these occurrences.

1. Pregnancy in the fallopian tube (graviditas tubaria) is

the most frequent of all; the ovum attaches itself either near the fimbriated extremity, or more towards the uterus; this part of the tube becomes dilated into an oval sac, with eccentric development. This variety of pregnancy generally proves fatal in the third or fourth month by hemorrhage into the peritoneal cavity, from rupture of the sac either with or without an escape of the fœtus. We have however observed this occurrence in one case at the sixth week, and in another a fortnight after conception. On the other hand, an old preparation existing in the Viennese Museum, appears to prove that pregnancy may continue to the sixth or seventh month. Of six cases of tubal pregnancy preserved in the same collection, five are on the right side.

2. *Pregnancy in the parietes of the uterus.*—This kind of pregnancy, which has also received the name of interstitial pregnancy, and about the seat of which various opinions have been promulgated, is probably nothing more than a pregnancy of the fallopian tube, i. e. a pregnancy occurring in that portion of the tube which traverses the uterine tissue. It is, consequently, in a close relation with the uterus, and necessarily involves the uterine parenchyma in such a manner that the cavity which contains the fœtus with its membranes, appears to have been developed within the tissue of the uterus. It will consequently be most appropriate to consider it as tubo-uterine pregnancy. The pregnant sac consists of uterine tissue, its walls are of considerable thickness, and are in direct connexion with the uterus; the sac is more or less distinctly seated at the side of the fundus uteri, and uterine fibres are traceable into it.

This pregnancy generally proves rapidly fatal by rupture; however it is evident, both from our own observations and those of other morbid anatomists, that it may terminate in a different manner. At various periods of the normal progress of pregnancy, the sac, probably in consequence of the traction exerted upon it, becomes the seat of chronic inflammation, which passes into suppuration and gangrene; after causing the death of the fœtus, this either proves fatal by itself or by inducing peritonitis. The sac may suppurate chiefly in one direction, and thus involve the adjoining viscera; so that, after their destruction, it may discharge its contents externally or into the cavities of neighbouring organs; this is generally effected slowly and piecemeal. In other cases, pregnancy not only attains, but even extends beyond the full period. The parietes of the sac in this case are of considerable substance and thickness; the sac itself is capacious, and contains a mature or even an over-ripe hypertrophied fœtus. In one case of this description the pregnancy lasted sixteen months, and the over-ripe fœtus, which had died some time previously, was extracted by opening the abdominal cavity and the sac.

3. Peritoneal pregnancy, graviditas peritonealis, occurs within the cavity of the peritoneum; the fœtus with its membranes is surrounded by an organic exudation attached to the peritoneum, and the placenta is found connected with the most different parts of the parietal and visceral laminæ of the peritoneum. This form of pregnancy generally terminates fatally at various periods by peritoneal inflammation; sometimes the peritonitis ends in suppuration, which may cause the effete fœtus, together with the formative organs, to be discharged by various passages.

4. Ovarian pregnancy is the most unfrequent form of the extra-uterine pregnancy; it either terminates in laceration, which is at once fatal, or in inflammation and suppuration of the sac, which in their turn prove fatal, or cause a diminution of the fœtus.

5. Vaginal pregnancy is not only the rarest of all, but altogether problematical.

Although we have given an anatomical account of the chief terminations occurring in extra-uterine pregnancy, we will add a comparative analysis, and also subjoin one that we have not yet mentioned.

Interstitial, ovarian, and tubal pregnancy terminate by laceration; the last two at an early period, the first much later, and even after the usual duration of pregnancy.

All the varieties of extra-uterine pregnancy may terminate in inflammation with consequent suppuration, owing to the decomposition of the defunct fœtus, and the putrescence of its involucra. Inflammation may, in advanced interstitial pregnancy, doubtless arise in the sac primarily, from the traction exerted upon its tissue and upon the peritoneal investment, and thus induce the death of the fœtus. If the suppurative process attacks the organs adjoining and adherent to the sac, the latter may discharge itself externally through the abdominal parietes or into the cavity of an adjoining organ; the fœtus may thus be eliminated entire, or piecemeal, in a state of maceration, saponification, or putrefaction. This has been observed repeatedly; single bones belonging to the fœtus having been seen to pass through the navel, at different parts of the hypogastric region, and still more frequently by the anus or the urinary passages. It is stated that, after this has taken place, a cure may follow; but death from exhaustion is a more common consequence. The discharge may occur long after the usual period of pregnancy has terminated.

Besides the above-mentioned modes of termination there is another, which must be viewed as the most favorable one; in this case the fœtus dies before or after it has attained maturity, and, after the surrounding fluids have been removed by absorption, becomes mummefied and indurated; or if the soft tissues have already undergone a certain degree of decomposition, it may become incrusted by a greasy, chalky substance (lithopædion), and in this shape be borne for a long time in the contracted sac, without much inconvenience. This termination occurs chiefly in peritoneal pregnancy, it has however also been observed in pregnancy in the fallopian tube.

In all extra-uterine pregnancies we commonly observe the formation of a deciduous membrane on the inner surface of the uterus; and the latter undergoes, up to a certain period, the same changes that it would present if it contained the fœtus. It scarcely ever exceeds the dimensions which it exhibits about the first and second month of normal pregnancy. This development of the uterus is undoubtedly more considerable in interstitial and tubal pregnancy, than in the other varieties of extra-uterine pregnancy, and may be considered as analogous to the development of the unimpregnated half of the uterus bicornis or bilocularis.

§ 2. *Degeneration of the Ovum.*—We here but allude to those cases of degeneration of the ovum which are called moles, and which are distinguished according to their external appearance, structure and density, as carneous, vesicular moles, &c. We exclude all abnormities in the formation of the fœtus, and remark that moles generally contain no fœtus, as the degeneration of the membranes and the placenta, mostly occurs at a very early period of pregnancy, in consequence of which the embryo dies and disappears, the cavity of the amnios remaining persistent or becoming obliterated. The diseases in which the moles of which we speak originate, will be adverted to in the following pages, and we shall take care to point out the connexion.

§ 3. *Abnormities of the separate parts of the Ovum.*

1. *Abnormities of the Membranes and of the Liquor Amnii.*—The membranes of the ovum may undoubtedly become the seat of hemorrhage and inflammation at a very early period of pregnancy; these affections are probably the cause of the formation of moles, but they may also give rise to abortion. The dirty white and ash-coloured spots occurring in various sizes upon the amnion, and accompanied by thickening of the membranes, and the opacity sometimes affecting the greater part of the amnion, evidence previous inflammation. But under this head we must more particularly instance the deposits of a grayish-red, whitish, or yellowish substance, occurring on the chorion and the decidua, in the shape of patches. The membranes here present a thickening without distinct edges, or flattened rounded nodules; the tissues being either softened and friable, or indurated and dense. Occasionally the membranes, in consequence of a cretification of the deposit, are encrusted, or contain a chalky grit.

The albuminoid layer which represents the so-called tunica media, is not unfrequently morbidly increased in quantity; sometimes a thin, brawny, or watery accumulation is substituted for it, and to the latter the discharge of the so-called spurious liquor amnii in the second half of pregnancy, is probably due (Hydrallantois). In other cases its amount is very small, or it presents greater consistency, and may even be tough and membraneous.

The villi of the chorion degenerate at an early period of pregnancy, into pedunculated vesicles or cysts, which are placed at their extremities; a degeneration which is also seen in the placenta; when occurring in an extensive and advanced degree they represent what has been termed the vesicular or hydatid mole.

Occasionally we discover more or less extensive adhesions between the embryo and the amnion, which is a circumstance of some importance, on account of the impediment it offers to the proper development of the fœtus.

The liquor amnii is sometimes so much reduced in quantity, that the fœtus is closely invested by the amnion, at others it is excessive (hydramnios); it is also found more or less opaque, discoloured, and fetid.

2. *Abnormities of the Placenta.*—*α*. The placenta offers considerable variations as to size, without being morbidly affected. We have here only to mention that extreme development of the intervascular substance of the decidua which compresses the vessels; as well as the occurrence of atrophy with relaxation, a contraction accompanied by coriaceous toughness, the causes and original seat of which doubtless vary, but with the exception of inflammation are unknown.

β. The placenta presents no remarkable pathological changes in point of form, with the exception of its division into a few large or numerous smaller lobules. The various shapes presented by the placenta offer no interest in reference to pathology.

γ. The placenta presents numerous deviations in regard to position; its position at the inferior segment of the uterus deserves particular mention, as its eccentric or concentric development at the os uteri induces considerable perils towards the end of pregnancy, by giving rise to frequent and lasting hemorrhage.

δ. Allied to this hemorrhage are the floodings which, though the placenta occupies its normal position, are brought on by concussion or contusion of the pregnant womb, inducing a forcible separation of the placenta from the uterus, or a laceration of the former, or which are the result of rupture of the uterine vessels of the placenta caused by extreme congestion. Whether or not accompanied by external bleeding, they represent apoplexy of the placenta, one of the most frequent causes of abortion; the blood may be diffused through the parenchyma to a greater or less extent, or be extravasated and accumulated at one spot, which may either adjoin the uterine parietes or be situated deeply within the placental tissue. The placenta is undoubtedly sometimes affected with plethora, congestion, and diminution in the rapidity of the circulation, a condition which is important on account of the impeded vivification of the fœtal blood. It is then of a darker colour, externally and internally of a dark violet or livid hue, the vessels are overcharged, the entire organ appears enlarged and heavier, and feels harder and denser.

ε. Among the textural diseases, inflammation is the most frequent; it generally occurs in the lobular form, as it attacks small sections or lobules, and rarely larger portions of the placenta. Still a considerable portion may be simultaneously or successively attacked even in the first instance, inasmuch as the products of the process are found scattered over numerous spots. It recurs at different and new points to the end of pregnancy; an opportunity is thus presented of observing it, if not in its first stage, at least shortly after the formation of the product, and of tracing the metamorphoses of the latter.

Inflammation of the placenta generally gives rise to a plastic fibrinous deposit, which is reddened by the colouring matter of the blood which it contains, and by which the diseased portion is rendered denser and more lacerable. This may be termed hepatization of the placenta; it may be recognised by the increased resistance and nodulated tumefaction presented to the touch. In the course of time the deposit assumes a pale red, grayish or yellowish-red, or even yellowish-white tinge; at the same time it becomes firmer, and together with the included obliterated tissue, contracts and shrivels. The inflammation has thus terminated, as it usually does, in induration and obliteration of the placental tissue, which is converted into an ashy, tough, leathery callus, resembling elastic tissue.

It appears an established fact that an adhesion may form between the placenta and the uterus in consequence of a process of this kind; the extent as well as the intimacy of the union naturally varies.

In rare cases the inflammation may give rise to a purulent product, causing suppuration of the placenta in the shape of circumscribed globular abscesses, or of diffused infiltration and fusion of the placental tissue—phthisis placentæ.

The question as to the seat of the inflammatory process, or rather as to which of the vascular systems is affected, has not as yet been answered; doubtless either of the two may be involved, and it is to be presumed that in both cases the results will be the same, on account of the intimate connexion existing between them.

Inflammation and consequent obliteration of the placenta are the more likely to induce imperfect nutrition, and consequent tabes of the fœtus, the more they are diffused and the greater the number of placental sections attacked at the same time.

The fœtal portion of the placenta, as we have already mentioned when speaking of the villi of the chorion, is not unfrequently attacked by a degeneration in the shape of round or oval fusiform, pedunculated, serous vesicles or hydatids, which diminish, and even entirely obliterate the cavity of the amnion. This is a vesicular or hydatid mole, Laennec's acephalocystis racemosa.

Foreign observers have given instances of osseous deposits in, or ossification of the placenta; they are gibbous, nodulated, or cordate formations, which are probably developed in the placental tissue after it has been obliterated by inflammation, or in the fibrinous coagula caused by hemorrhages.

Tubercle does not occur in the placenta; one must be careful not to confound the product of inflammation, which sometimes has a cheesy, friable, and chalky appearance, or a fibrinous coagulum caused by hemorrhage, which is undergoing a similar metamorphosis, with placental tubercle.

The observations recorded of scirrhus, or scirrhous degeneration of the placenta, may justly be considered as erroneous; the cases described as such, are obliterations of the placental tissue after inflammation, indurated inflammatory products, or old, shrivelled, decolorized extravasations of blood, &c. Adhesions similar to those which we mentioned when speaking of the membranes, are found to occur between the placenta and the fœtus.

3. *Abnormities of the Umbilical Cord.*—The instances of absence of the funiculus umbilicalis, recorded by ancient writers, must evidently, as Meckel has pointed out, be considered as cases of extreme shortness of the cord. The subject is of considerable importance on account of its influence upon arrest of development, particularly of the inferior half of the fœtus.

The cord varies considerably in length. Davis has seen one of two, Montault of four, Meissner and myself of five inches only; whilst, on the other hand, Baudelocque has noticed one of forty-six, and Heritier one of fifty-seven inches. In the Viennese Museum there is a cord attached to a large placenta, which measures fifty-four inches; and if we allow five or six inches for the distance at which it was probably severed from the navel, the whole cord must have been from fifty-nine to sixty inches in length.

The chief deviations as to the insertion of the cord are the marginal attachment, and the insertion external to the placenta into the membranes. Occasionally we notice a premature separation of the vessels, and of the two arteries; one not unfrequently is absent, and the other is then commonly a direct continuation of the abdominal aorta.

The true knots of the umbilical cord that occur in rare cases, are of importance, as they may occasion obstacles to, or a cessation of, the circulation, in consequence of the traction exerted upon them during parturition.

Irregularities in the position of the umbilical cord very frequently present themselves in the shape of circumvolutions round different parts of the fœtus; if traction is exerted upon them, the circulation may be impeded in the cord, as well as in the part of the fœtus which they surround.

Rupture of the umbilical cord, or of its component vessels, and especially of the vein, are of very rare occurrence. They result from extreme traction, when the cord is either too short or twisted.

Adhesions have been noticed in rare cases between the funiculus umbilicalis, and the fœtus and the membranes.

The gelatinous matter of the cord is either excessive, and the latter then appears much enlarged; or it is diminished in quantity, in which case the cord is thin, flabby, and corrugated.

The umbilical vein presents varicose dilatations and contractions, the latter particularly in the vicinity of the navel. The sheath of the cord occasionally contains serous cysts.

4. *Abnormities of the Fœtus.*—We pass over those deviations of congenital development which we have already discussed, and devote this section to the consideration of the remaining

anomalies, although we have already cursorily touched upon most of them.

We not unfrequently meet with an hypertrophy of the fœtus, or of individual organs and sections of the fœtal body. Children are sometimes born, either at the proper period or later, of excessive dimensions, over-nourished and endowed with all the characters of over-ripeness. Among the partial hypertrophies we have to specify those of the brain, of the thyroid and thymus glands, the hypertrophy of certain parts of the skeleton, as the premature development of the cranium, the excess in the digital phalanges of the hands or feet, the so-called hypertrophies of the liver and the spleen.

The entire fœtus may be atrophic, in consequence of the cachectic state of the mother; but those cases are of greater importance which result from disease of the membranes, the placenta, and the cord; and if occurring at the earliest period of embryonic life, may cause the embryo to disappear entirely, or so far as to leave but mere traces. Partial atrophy, as a result of disease in the nervous centres, occasionally affects the extremities; in rare cases, it may be the consequence of pressure exerted by the uterus on the funiculus umbilicalis.

The most various curvatures and malpositions of the bones (pes equinus), curvatures and dislocations of the joints, may be brought on by contraction of the uterine cavity, external pressure, convulsions, and tonic spasms of the fœtus. Convulsions or traumatic injuries may induce fractures of the bones, and even rupture of the abdominal viscera, and especially of the liver and the intestines.

To these lesions of continuity we have to add the spontaneous amputations of extremities (Simpson, Montgomery), occurring at an early stage of embryonic life; they have not as yet been sufficiently accounted for, and are to be carefully distinguished from cases of arrest of development.

The fœtus may be affected by general plethora, as well as by congestion of separate organs, which ultimately degenerates into hemorrhage and apoplexy. The brain and spinal marrow and their membranes, the thyroid gland, the liver, the kidneys, and the suprarenal capsules are particularly liable to be attacked.

A most important morbid process and one of very frequent occurrence, the peculiarities of which in the fœtus are almost unknown, is inflammation. Its terminations and consequences are of great value in regard to the doctrine of deviations of formations, for a reconstruction of which we are particularly indebted to Simpson, whose views on the subject are of peculiar interest. Inflammation attacks almost all the organs, including those peculiar to fœtal life, the thymus, and the suprarenal capsules. Its terminations and consequences the more resemble those which it presents in the infant and adult, the more mature the fœtus, the more developed the tissues attacked, are. It gives rise to plastic products with adhesions between adjoining organs, accompanied by the most various new formations; it induces suppuration and suppurative destruction, though very rarely induration. On the other hand, it causes in very delicate embryos, and in particular tissues of peculiar delicacy, a very rapid dissolution, or liquefaction, either of a benignant or a malignant character.

Dropsy of the different cavities and anasarca, have been noticed in the fœtus; among the former, hydrocephalus and hydrorrhachis are both in themselves, and on account of the consequent arrest of development and the malformation of the cranium and of other parts, of chief importance. Cutaneous dropsy sometimes attacks the fœtus in a very eminent degree, and is generally combined with dropsical accumulations in the large cavities. It has been particularly and repeatedly observed in the children born of women who had themselves suffered from dropsy during pregnancy (West); it also occurs under other circumstances, and in these cases probably originates in obstacles to the circulation through the umbilical vessels and the fœtal portion of the placenta.

Even adventitious growths occur, though rarely, in the fœtus; we occasionally discover cysts, particularly the simple cyst, lipomatous, sarcomatous, and even cancerous products. Although many of the cases that have been considered as cancerous, rest upon a misapprehension, the occurrence of carcinoma is undoubted and of peculiar interest. Fœtal cancer is allied to the cancer, and especially to the medullary variety, occurring during infancy; we communicate the following case that we have ourselves observed, as one of peculiar interest.

A female infant, of 16½ inches in length, and 27 days old, presented in the region of the pudenda, anus, and sacrum, a tumour tensely invested by the cutaneous covering. It was of the size of a goose's egg, and had, towards the sacral and lower lumbar vertebræ, a conoid process of the size of a hazelnut. On its left side were noticed the vaginal and anal opening, which were pushed downwards and separated, the latter appearing in the shape of an excoriated semilunar fissure. The child was born with this tumour. It lay external to the pelvis, under the skin and the perineal muscles; posteriorly, fibres of the glutæus magnus spread over it. It was surrounded by a fibrous sheath, and consisted of various tissues; the inferior third, and the portion that lay more to the right, resembled the reddish-gray cerebral substance of an infant's brain, whereas the two upper thirds presented a follicular tissue with small loculi, containing a grayish gelatine. The tumour extended into the pelvis by the inferior aperture, in the shape of an oval serous cyst of the size of a walnut, the internal surface of which appeared here and there to contain a black pigment, and presented a few ridge-like duplicatures. The follicular portion of the morbid product also forced its way through the sacral fissure into the medullary canal, and then presented a process closely resembling the external conical process, except that it was smaller.

This adventitious product is nothing more than a combination of areolar and medullary cancer, the circumference of which is converted into a cyst.

Tubercle occurs but in very rare cases in the fœtus; we ourselves have never observed it.

The fœtal fluids are undoubtedly liable to numerous acute and chronic morbid affections, as is evidenced by the occurrence of various exanthematic and impetiginous diseases, as well as cachectic disorders, such as rickets, syphilis, tubercle, peculiar hypertrophies of the liver, the spleen, the lymphatic glands.

Variola, measles, and various cicatrices have been noticed on the fœtal integuments. To this head also pertains pemphigus and various vesicular eruptions, the vesicles of which contain a livid, sero-purulent fluid, are converted into ulcers, and may be traced to syphilitic causes. We also find ecchymoses, petechial suffusions of the skin, shallow or elevated nævi, of a brown or livid hue, and of different sizes. The subcutaneous cellular tissue is the seat of anasarca and of many of the above-mentioned tumours and morbid growths; shortly after birth, it is frequently attacked with induration.

The serous membranes are found more frequently inflamed than any other tissue, or the previous existence of inflammation in them is evidenced by adhesions of the organs which they invest; these, undoubtedly, give rise to many of the anomalies in the position of these organs, which are in part at least looked upon as the consequence of original malformation and arrest of development.

Peritoneal inflammation is, doubtless, the most frequent, and it is upon this fact and upon the adhesive termination of the disease, that Simpson bases his views regarding many of the anomalies that are commonly considered as cases of arrest of development. Inflammation of the pleura and pericardium are less frequent.

Among the mucous membranes, that of the alimentary tube is the chief seat of disease, as we shall have occasion to explain more fully in the sequel.

In addition to the above-mentioned fractures, dislocations, and spontaneous amputations, we find the osseous system liable to suppurative inflammation (caries), hyperostosis, and an exuberant deposit of callus, an arrest in the process of ossification, which is allied to rhachitism (rhachitis congenita).

The morbid processes in the muscular system which we chiefly meet with, are contractions; they depend mainly upon diseases of the nervous centres.

The heart is liable to be affected, in the first instance, by pericarditis; in the second, by endocarditis. It is very remarkable, that the relation of the latter to the cavities of the heart is the reverse of what occurs after birth. The dilatations and valvular affections observed at the left ventricle and its arterial orifice in the adult, as a consequence of endocarditis, are here found to attack the right ventricle and the valves of the pulmonary artery.

The stenoses observed in the latter, which originate in a morbid metamorphosis of the valves, are to be carefully distinguished from cases of arrest of development occurring here, especially in the shape of atrophy of the pulmonary artery, resulting from anomalies in the structure of the heart.

The ductus Botalli is in rare cases liable to an aneurismatic dilatation, and in this respect resembles the aorta in extra-uterine life.

The brain and the spinal cord are particularly subject to disease in the fœtus; and these affections are undoubtedly the cause of many defects and malformations of the brain and spinal cord, their membranous sheaths and osseous cases, and of defect and malformation of other organs which have hitherto been considered as anomalies of original development.

Thus we observe hypertrophy of the brain, which in rare cases attains such an extent as to cause the development of the cranium to appear entirely arrested.

Apoplexy occurs very rarely as hemorrhage within the substance of the brain; but we often find both in the fœtus and the newborn infant a vascular apoplexy, and extravasation into the tissue of the membranes and into the cavity of the arachnoid.

Inflammation and its consequences, inflammatory softening and complete liquefaction of the brain, are much more frequent. These and hydrocephalus are doubtless the commonest cerebral diseases of the fœtus, and upon the former the defects and numerous malformations depend which are found in hydrocephalic fœtuses.

Hydrocephalus and hydrorrhachis are, in the fœtus as at a later period, the result of repeated exudative processes affecting the investments of the cerebral cavities and the spinal canal. They are well known often to attain such a degree, that not only the dilated and imperfectly ossified cranium offers an obstacle to parturition, but that the brain and the spinal cord are gradually destroyed by compression; that they are ruptured at an early stage of embryonic life, or are dislocated in various directions, and forced out of the cranium at later periods.

In the respiratory apparatus of the fœtus we find that the pulmonary parenchyma and the bronchi occasionally become diseased. The former is said to have been found in a state of hepatization, and even abscesses have been seen in the lungs. The bronchi are frequently charged with mucus, and atelectasis neonatorum is probably caused by a mere catarrhal affection of the mucous membrane and an obstruction of the capillary bronchi by mucus. (Vid. Vol. III, Acute Catarrh of Respir. Org.)

The thymus gland of the fœtus may, according to Veron, be attacked by inflammation and suppuration.

In the digestive apparatus, the peritoneum, the entire intestine, and its appendages may become diseased during uterine existence.

The peritoneum is frequently the seat of inflammation of an acute or chronic character, causing exudations, that vary in quantity and quality. It may be limited to one portion, or be universal. It not only induces thickening of the peritoneum, but also adhesions among the abdominal viscera, and between them and the parietes; the sooner it sets in, the more it is likely to operate as the cause of numerous anomalies in the abdomen, which have been hitherto considered as cases of arrest of development. (Simpson.) The inflammation may originate in unknown causes, or in such as are anatomically demonstrable, as constriction of the intestine, hemorrhage of the liver into the peritoneal cavity, extravasation of the contents of the intestines, or of urine; the latter may occur at a very early period, for it has been noticed in a fœtus of four months. It sometimes kills the fœtus before maturity, at others death ensues shortly after birth.

As regards the alimentary tube, both hyperæmia of its mucous membrane and anæmia, with waxy paleness and softening, have been frequently observed. The latter affection is of particular importance in the fœtus. The former not unfrequently attains such a degree as to warrant the application of the term apoplexy; it is generally associated with hyperæmia of other abdominal viscera and general plethora, and may be accompanied by ecchymoses in the tissues and extravasation of blood into the intestinal cavity.

Inflammation and the allied processes are generally limited to the follicular apparatus of the ventricular and intestinal mucous membrane, which are comparatively very much developed. The former occasionally presents an hemorrhagic fusion (erosion) of the follicles in a very marked degree; the follicular apparatus of the intestinal mucous membrane is still more frequently diseased. In the small intestine, the glands of Peyer are chiefly found more or less swollen, reddened, and of a fleshy sarcomatous appearance, or pale, i. e. yellow or grayish-red, containing, like the solitary follicles, a variety of reddish or grayish, more or less dense, opaque, milky or curdled, serous, flocculent fluids. These morbid enlargements of the intestinal follicles, caused by tumefaction and imbibition of the tissues, and the presence of a variously modified product, are here too undoubtedly (vide p. 89) closely associated with anomalies in the vital fluids, with morbid conditions of the mesenteric glands, abnormal enlargement of the thymus, or with tumefaction of the spleen, but their real nature remains an enigma. The indurated swellings of the Peyerian glands occasionally resemble closely the typhoid infiltration found in adults, and may indeed result, if not from an identical, at least from a very similar process. Follicular tumefaction also occurs frequently in the large intestine of the fœtus and the new-born infant; and, as in the adult, without any coexistent affection of the small intestine. The follicles appear much reddened, the entire mucous membrane is swollen, and invested with a yellowish-white secretion.

In very rare cases we meet with a diffused croupy inflammation, and a corresponding product in the intestinal mucous membrane.

The processes which we have just considered, do not appear to lead to ulceration in the fœtus; still there are cases on record of extensive ulcerative affections of the œsophagus and the entire alimentary tract.

Tumours and excrescences have been observed on the internal surface of the intestine, as well as callosities of the interstitial cellular tissue, especially of the stomach.

The fœtal liver is very often the seat of hyperæmia, which, on account of the delicacy of the hepatic tissue, easily degenerates into apoplexy with rupture.

Various infiltrations of the hepatic parenchyma may form even during fœtal existence, and we thus find the fatty, the waxy, the lardaceous liver accompanied by the characteristic enlargement, in which the left lobe, which at that period is comparatively of large dimensions, necessarily participates.

In the same manner, the spleen of the fœtus may suffer; it is often found in a state of acute or of chronic tumefaction, presenting in the first case looseness, in the second, remarkable condensation, resistency, and frangibility of texture. Tumours of the spleen bear the same import as in the adult, and result from the relation existing between the spleen and dyscrasic conditions of the blood. They occasionally attain a considerable size.

The salivary glands, and especially the pancreas, are very rarely affected in the fœtus; the cancerous induration of the pancreas noticed at page 179 must be considered as extremely remarkable.

The urinary organs of the fœtus do not frequently become diseased, but their affections occasionally attain a very considerable development. The kidneys are subject to hyperæmia and apoplexy; the passages have been found excessively dilated, to an extent varying with the seat of contraction or obturation; and the bladder has even been ruptured from the same cause. We quote the following case, taken from a preparation which is preserved in the Viennese Museum, both because it presents analogies to the various observations of this character that have been recorded, and on account of several peculiarities which it offers: A new-born male infant with a large abdominal cavity, is provided with a bladder of the size of a child's head, collapsed and agglutinated to the abdominal parietes by a thick exudation. The membranes are traversed by varicose veins, which presented a blue colour when fresh, and the urethra is narrow, though patent. The inferior portions of the ureters are dilated to the size of the small intestine of an adult, the upper portions less so, the right being of the size of a little finger, the left one larger; the pelves and calices of the kidneys, which are of the size of walnuts, are moderately dilated. The ureters are coiled up and bent, and their curvatures are bound down by a tense cellular sheath: both terminate blindly at the sides of the bladder. The right one is accompanied by an unsymmetrical umbilical artery, which proceeds from the point of origin of the renal arteries. All the other abdominal viscera are pushed upwards, and the entire intestine is very narrow, scarcely presenting a diameter of one line; the abdominal integuments are œdematous, and are superficially ulcerated, below the insertion of the umbilical cord, to an extent of three inches by nine lines or one inch. They are considerably thinned, and of an irregular thickness, presenting a cribriform perforation at one spot, and adhering to the anterior surface of the bladder. The peritoneum was invested by a plastic exudation, and contained six ounces of a yellow, opaque fluid.

The cysts of which we have spoken at page 205, also occur in the fœtal kidneys, and may be so numerous that the latter appear converted into one mass of cysts.

We frequently have opportunities of observing spots in the fœtal kidneys which are variously discoloured, and which present a morbid induration of the tissue. They most probably result from inflammation, and are occasionally associated with traces of a similar process in the adipose sheath of the kidneys.

The suprarenal capsules have been found in a state of suppuration.

END OF VOL. II.

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